eecsi 2018

Organizer:

UMM
UNIVERSITAS MUHAMMADIYAH MALANG

Sponsored by:

RISTEKDIKTI

Technical Co.Sponsorship:

IEEE
INDONESIA SECTION

PROCEEDING

2018 5th International Conference on Electrical Engineering, Computer Science and Informatics

Indexed by:

Scopus®

October
16 - 18, 2018

Ijen Suites
Resort & Convention
Malang, Indonesia

Co.Organizers:

Universitas Diponegoro Semarang

Universitas Ahmad Dahlan

Universitas Islam Sultan Agung UNISSULA

iaes
Institute of Advanced Engineering and Science

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

PROCEEDINGS

2018 5th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI 2018)

16-18 October 2018, Malang, Indonesia

Editors:
Anton Yudhana, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
Zulfatman, Universitas Muhammadiyah Malang, Indonesia
Deris Stiawan, Universitas Sriwijaya, Palembang, Indonesia
Munawar A. Riyadi, Universitas Diponegoro, Semarang, Indonesia
Imam Much Ibnu Subroto, Universitas Islam Sultan Agung, Semarang, Indonesia
Agus Eko Minarno, Universitas Muhammadiyah Malang, Indonesia
Christian Sri Kusuma Aditya, Universitas Muhammadiyah Malang, Indonesia

PROCEEDINGS

2018 5th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI 2018)

ISBN : 978-1-5386-8401-6 (USB, Part Number : CFP18B51-USB)
ISBN : 978-1-5386-8400-9 (DVD, Part Number : CFP18B51-DVD)
ISBN : 978-1-5386-8402-3 (XPLORE COMPLIANT, Part Number : CFP18B51-ART)

Additional copies may be ordered to:
Lembaga Pengembangan Publikasi Ilmiah (LPPI)
Universitas Muhammadiyah Malang
Gedung Perpustakaan Pusat UMM, Jl. Raya Tlogomas No. 246, Malang, 65144.
+62341-464318 Ext. 243

Foreword from General Chair EECSI 2018

Foreword General Chair

In the name of Allah, the Most Beneficent, the Most Merciful.
Welcome to the 2018 5th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI 2018) in Malang, Indonesia.

The 5th EECSI 2018 is themed "Toward the Next Generation of Technology". This conference provides academicians, researchers, professionals, and students from various engineering fields and with cross-disciplinary working or interested in the field of Electrical Engineering, Computer Science, and Informatics to share and to present their works and findings to the world.

I would like to express my highly gratitude to all participants for attending, sharing and presenting your ideas and experiences in this interesting conference. Almost 300 papers had been submitted to EECSI 2018. However, the only high quality papers are selected and accepted to be presented in this event. We are also thankful to all the international committee, international reviewers, and steering committee for their valuable support. I would like to give a praise to all partners in publications and sponsorships for their valuable supports, especially for Ministry of Research and Higher Education (Kemenristekdikti) Indonesia.

Organizing a prestigious conference was incredibly challenging and would have been impossible to be held without outstanding committees. Such that, I would like to extend my sincere appreciation to all organizing committees and volunteers from Universitas Muhammadiyah Malang as a host and all colleagues from Universitas Diponegoro, Universitas Ahmad Dahlan, Universitas Sriwijaya, Universitas Islam Sultan Agung, Universitas Gadjah Mada, Universitas Budi Luhur, Universiti Teknologi Malaysia, and IAES Indonesia Section for providing me with much needed support, advice, and assistance on all aspects of the conference. A special thanks also for lEEE Indonesia Section for their contribution as technical co-sponsorship of the conference. We do hope that this event will encourage the collaboration among us now and in the future.

We wish you all find opportunity to get rewarding technical program, intellectual inspiration, renew friendships and forge innovation, and that everyone enjoys Malang.

Assoc. Prof. DR. Tole Sutikno
General Chair EECSI 2018

Foreword from IAES Indonesia Section

Bismillahirrohmannirrahim,
In the name of Allah Al Mighty, The Most Gracious, The Most Merciful

We are pleased to welcome our colleagues in the International Conference on Electrical Engineering, Computer Science and Informatics (EECSI 2018) in Malang, City of Heritage on October 16-18th, 2018.

It must be said proudly that the EECSI has been rolled out for five times since it was firstly initiated on year 2014 in Yogyakarta. Our colleagues all over the world supporting by many tops universities have successfully organized the conference to become the prestigious international annual event in Indonesia.

A highest appreciation is addressed to The Ministry of Research, Technology and Higher Education (Kemenristekdikti) Republic of Indonesia for a worthy technical and financial support during the conference and special thanks for IEEE Indonesia Section for the technical co-sponsorship for this prominent occasion. We do hope that this event will strengthen the collaboration among us now and in the future.

This year, the achievement in this conference is due to valuable contributions from our colleagues from Universitas Muhammadiyah Malang supporting by Universitas Diponegoro, Universitas Ahmad Dahlan, Universitas Sriwijaya, Universitas Islam Sultan Agung, Universitas Gadjah Mada, Universitas Budi Luhur and Universiti Teknologi Malaysia. I would like to express my sincere gratitude and appreciation for all partners, friends, Organizing committee, reviewers, keynote speakers, and participants who have made this event as great as today.

I would also like to extend my gratitude to Rector of Universitas Muhammadiyah Malang who friendly becomes a main host for this great conference. We optimist many following collaborative works will be carried out among us and all participants.

I hope you all had a nice time at the conference where all of you are able to learn something new, renewed and created new networks and at the same time have some fun in Malang City during the conference and Mount Bromo during the cultural tour.

Thank you.

Assoc. Prof. Mochammad Facta, Ph.D
IAES – Indonesia Chapter

Foreword from Rector of Universitas Muhammadiyah Malang

The advent of the next generation of technology, renown as Technology 4.0, is unavoidably incessant. This so-called technology has offered a new horizon in various aspects of man-beings' lives. To be particular in the fields of electrical engineering, electronics, computer science, computer engineering, and informatics, Technology 4.0 plays its potent role to underpin the future advancement of technology for the coming generations. Scientific forum titled as the 2018 5th International Conference on Electrical Engineering, Computer Science, and Informatics (EECSI 2018) hosted by University of Muhammadiyah Malang in collaboration with a number of universities is the manifestation of continuous effort to aim for the ever-changing technology.

Hereby, I would like to congratulate the Faculty of Engineering, University of Muhammadiyah Malang for their effort in organizing the 2018 5th International Conference on Electrical Engineering, Computer Science, and Informatics (EECSI 2018). I appreciate all co-organizers such as Universitas Diponegoro, Universitas Ahmad Dahlan, Universitas Sriwijaya, Universitas Islam Sultan Agung, Universitas Budi Luhur, and Universiti Teknologi Malaysia for their support in this mutual collaboration. Without the full and valuable supports from the international committee, international reviewers, and steering committee, this international conference remains a detached discourse without high commitment to conduct.

The expression of my high gratitude is devoted to the Ministry of Research, Technology, and Higher Education (Kemenristekdikti) Republic of Indonesia, IEEE Indonesia Section, and IAES Indonesia Section for their support to this event as the sponsors and technical co-sponsorship, respectively. Expectantly, this would be the initial and continual collaboration in the future.

To all speakers, presenters, and participants, thank you for participating and welcome to this conference. The success of this conference owes so much on your participation and contribution in promoting the knowledge, information, and robust creativity. To end with, this conference expectedly becomes an arena to build mutual ties among the academicians, researchers, industries, and society.

All the best to EECSI 2018

Dr. H. Fauzan, M.Pd.
Rector
Universitas Muhammadiyah Malang - Indonesia

ORGANIZING COMMITTEE OF EECSI 2018 CONFERENCE

Steering Committee

- Adam Skorek, IEEE MGA Awards and Recognation Chair (R7) Trois-Rivières, QC, Canada
- Pekik Argo Dahono, IEEE Indonesia Chapters Chair (EdSoc/EDS/PELS/SPS)
- Mochamad Ashari, Telkom University, Bandung, Indonesia
- Tumiran, Universitas Gadjah Mada, Yogyakarta, Indonesia
- Hermawan, Universitas Diponegoro, Semarang, Indonesia
- Zainudin Nawawi, Universitas Sriwijaya, Palembang, Indonesia
- Rahmat Budiarto, Albaha University, Baha, Saudi Arabia
- Sri Arttini Dwi Prasetyowati, Universitas Islam Sultan Agung, Semarang, Indonesia
- Kartika Firdausy, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
- Siti Nurmaini, Universitas Sriwijaya, Palembang, Indonesia
- Ahmad Mubin, Universitas Muhammadiyah Malang, Indonesia

General Chair

- Tole Sutikno, IAES Indonesia

Finance Chairs and Treasurer

- Wiwiek Fatmawati, Universitas Islam Sultan Agung, Semarang, Indonesia
- Lailis Syafa'ah, Universitas Muhammadiyah Malang, Indonesia
- Lina Handayani, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

Program Chairs

- Deris Stiawan, Universitas Sriwijaya, Palembang, Indonesia
- Mochammad Facta, Universitas Diponegoro, Semarang, Indonesia
- Agus Eko Minarno, Universitas Muhammadiyah Malang, Indonesia
- Machmud Effendy, Universitas Muhammadiyah Malang, Indonesia
- Fauzi Sumadi, Universitas Muhammadiyah Malang, Indonesia
- Christian Sri Kusuma Aditya, Universitas Muhammadiyah Malang, Indonesia

General Co-Chair

- Zulfatman, Universitas Muhammadiyah Malang, Indonesia
- Anton Yudhana, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

Publication Chairs

- Munawar A. Riyadi, Universitas Diponegoro, Semarang, Indonesia
- Balza Achmad, Universitas Gadjah Mada, Yogyakarta, Indonesia
- Yuda Munarko, Universitas Muhammadiyah Malang, Indonesia
- Wahyu A. Kusuma, Universitas Muhammadiyah Malang, Indonesia

Publicity Chairs

- Imam Much Ibnu Subroto, Universitas Islam Sultan Agung, Semarang, Indonesia
- Maskur, Universitas Muhammadiyah Malang, Indonesia
- Son Ali Akbar, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
- Sam F. Chaerul, Universitas Islam Sultan Agung, Semarang, Indonesia
- Ahmad Heryanto, Universitas Sriwijaya, Palembang, Indonesia

TECHNICAL PROGRAM COMMITTEE

Munawar Riyadi	Diponegoro University	Indonesia
Deris Stiawan	University of Sriwijaya	Indonesia
Rahmat Budiarto	Al-Baha University	Saudi Arabia
Nik Rumzi Nik Idris	Universiti Teknologi Malaysia	Malaysia
Haleh Aghajani	Baylor Scott & White Health	USA
Wassim Alexan	German University in Cairo	Egypt
Humaira Anwer	National University of Sciences & Technology, Islamabad	Pakistan
Mahdi Baradarannia	University of Tabriz	Iran
Zesheng Chen	Purdue University Fort Wayne	USA
Deniz Dal	Ataturk University	Turkey
Abubaker Gaber	University of Technology Malaysia	Malaysia
Maxime Leclerc	Thales Canada Inc	Canada
Mingkang Li	Robert Bosch GmbH	Germany
Xian Li	Southeast University	P.R. China
Chih-Chin Liang	National Formosa University	Taiwan
Agus Minarno	Universitas Muhammadiyah Malang	Indonesia
Davood Mohammadi	Khorasan Regional Electrical Company	Iran
Chressen Much	Universitätsklinikum Eppendorf	Germany
Maurice Ntahobari	Institut Teknologi Sepuluh Nopember	Indonesia
Naveed Sabir	Mehran University Of Engineering & Technology, Jamshoro	Pakistan
Abdulqawi Saif	Université de Lorraine	France
Steffen Späthe	Friedrich-Schiller-University Jena	Germany
Robert Szabolcsi	Óbuda University	Hungary
Amin Torabi Jahromi	Persian Gulf University	Iran
S Zafaruddin	Bar-Ilan University	Israel
Mudrik Alaydrus	Universitas Mercu Buana Jakarta	Indonesia
Mohammed Alghamdi	Al-Baha University	Saudi Arabia
Harikumar Rajaguru	Bannari Amman Institute of Technology	India
Ali Tekeoglu	SUNY Polytechnic Institute	USA
Ameur Bennaoui	University of Science and Technology (USTO)	Algeria
Ashish Tanwer	Stony Brook University	USA
Haikal Satria	Universiti Teknologi Malaysia	Malaysia
Paolo Crippa	Università Politecnica delle Marche	Italy

LIST OF REVIEWERS

Abdel Ghani Aissaoui	University of Bechar	Algeria
Abdelfatteh Haidine	ENSA El Jadida - University Chouaib Doukkali	Morocco
Abdualah Aljankawey	University of New Brunswick	Canada
Abdulfattah Noorwali	University of Western Ontario	Canada
Abdullah Alomari	Albaha University	Saudi Arabia
Abhijeet Kumar	Pune Insitute of Computer Technology	India
Abul Bashar	Prince Mohammad Bin Fahd University	Saudi Arabia
Adrian Kliks	Poznan University of Technology	Poland
Adrian Tam	Clarity Solutions Group	USA
Ahmed Abotabl	Samsung Semiconductors Inc.	USA
Ajay Dadhich	Govt. Engineering College Ajmer	India
Aji Wibawa	Indonesia	Indonesia
Akbar Sheikh-Akbari	Leeds Beckett University	United Kingdom
Akhil Gupta	Lovely Professional University	India
Alain Richard Ndjiongue	University of Johannesburg	South Africa
Albert Alexander	Kongu Engineering College	India
Alexander Sergienko	St.-Petersburg Electrotechnical University	Russia
Ali Al Janaby	University of Mosul	Iraq
Ali Tekeoglu	SUNY Polytechnic Institute	USA
Alon Slapak	RodRadar	Israel
Ameur Bennaoui	University of Science and Technology (USTO)	Algeria
Amin Aeenmehr	Production Technology Research Institute	Iran
Amin Torabi Jahromi	Persian Gulf University	Iran
Amit Kumar	Galgotias University	India
Amiza Rasmi	TM Research & Development	Malaysia
Amrit Mukherjee	Jiangsu University	P.R. China
Andang Sunarto	Fakultas Ekonomi dan Bisnis Islam, IAIN Bengkulu	Indonesia
Andrea Vicenzutti	University of Trieste	Italy
Andrew Lowe	Auckland University of Technology	New Zealand
Andrews Samraj	Mahendra Engineering College	India
Antonio Oliveira-Jr	Federal University of Goias	Brazil
Anupama Kowli	IIT Bombay	India
Archana Shinde patil	Rajarambapu Institute Of Technology, Rajaramnagar	India
Arshad Muhammad	Sohar University	Oman
Arvind Singh	University of Pretoria	South Africa
Asaad Elmoudi	Red River College	Canada
Aseel Ajlouni	University of Jordan	Jordan
Ashish Kumar	Manipal University Jaipur	India
Ashish Tanwer	Stony Brook University	USA

Ashwani Yadav	Amity University Rajasthan	India
Atif Khan	University of Chicago	USA
Azilah Saparon	Universiti Teknologi MARA	Malaysia
Azmi Abdulbaki	University of Anbar	Iraq
Bagus Haryadi	Universitas Ahmad Dahlan	Indonesia
Bala Vishnu J	Anna University	India
Basari Basari	Universitas Indonesia	Indonesia
Benny Hardjono	Universitas Pelita Harapan	Indonesia
Benoît Muth	Benoît Muth	France
Bogdan Cristea	Laird	Romania
Candid Reig	University of Valencia	Spain
Changyan Ran	Three Gorges University	P.R. China
Chen Qiu	Samsung Electronics America	USA
Cheng Chen	Intel Corporation	USA
Cheruku Kumar	Amity University Rajasthan	India
Chih-Chin Liang	National Formosa University	Taiwan
China Sonagiri	Institute of Aeronautical Engineering	India
Chitrangada Roy	Sikkim Manipal Institute of Technology	India
Chong Yen Fook	University of Malaysia in Perlis	Malaysia
Chuan-Ming Liu	National Taipei University of Technology	Taiwan
Chung-Liang Chang	National Pingtung University of Science and Technology	Taiwan
Cong Pu	Marshall University	USA
Dan Dobrea	Technical University "Gh. Asachi"	Romania
Darmawaty Mohd Ali	Universiti Teknologi MARA	Malaysia
Davood Ghaderi	Bursa Technical University	Turkey
Dawam D. Jatmiko Suwawi	Telkom University	Indonesia
Deepak Punetha	Tula's Institute, Dehradun	India
Deepak Subramanian	Trusted Labs	Singapore
Deepti Theng	G. H. Raisoni College of Engineering	India
Deniz Dal	Ataturk University	Turkey
Deris Stiawan	University of Sriwijaya	Indonesia
Dharmendra Mahato	Birsa Institute of Technology Sindri, Dhanbad	India
Dilşad Engin	Ege University	Turkey
Dimitrios Kallergis	University of Piraeus	Greece
Divya Rishi Shrivastava	Manipal University Jaipur	India
Dominik Luczak	Poznan University of Technology	Poland
Donato Impedovo	Università degli Studi di Bari	Italy
Dr Eng Harish Kumar	King Khalid University	Saudi Arabia
Duc-Lam Nguyen	Seoul National University	Korea
Dwi Lastomo	Institut Teknologi Sepuluh Nopember Surabaya	Indonesia
E Hari Krishna	University College of Engineering, KU, Kothagudem	India
Eduard Babulak	National Science Foundation	USA
Eduardo Pinos	Universidad Politécnica Salesiana	Ecuador

Edward Moreno	UFS - Federal University of Sergipe	Brazil
Ehab Hussein	University of Babylon	Iraq
Elias Aboutanios	University of New South Wales	Australia
Elisha Nyamasvisva	Infrastructure University Kuala Lumpur	Malaysia
Elnaz Limouchi	Florida Atlantic University	USA
Ema Rachmawati	Telkom University	Indonesia
Emre Kiyak	Anadolu University	Turkey
Enrico Tronci	Sapienza University of Rome	Italy
Eraclito Argolo	Universidade Federal do Maranhão	Brazil
Esmeralda Djamal	Universitas Jenderal Achmad Yani	Indonesia
Evgeny Markin	USA	Russia
Ezra Morris Gnanamuthu	Universiti Tunku Abdul Rahman	Malaysia
Fairul Azhar Abdul Shukor	Universiti Teknikal Malaysia Melaka	Malaysia
Faliu Yi	University of Connecticut	USA
Farhan Siddiqui	Dickinson College	USA
Farshid PirahanSiah	MIMOS Berhad (Deep Learning)	Malaysia
Fatimah Salim	Universiti Teknologi Malaysia (UTM)	Malaysia
Federico Menna	EIT Digital	Belgium
Felix Albu	Valahia University of Targoviste	Romania
Fernando Mussoi	Federal Institute of Santa Catarina	Brazil
Francesco Grasso	University of Florence	Italy
Francesco Verde	University of Napoli Federico II	Italy
Franco Simini	Universidad de la Republica	Uruguay
Fred Berry	Purdue University	USA
Galymzhan Nauryzbayev	LN Gumilyov Eurasian National University	Kazakhstan
Gang Wang	PCTEL, Inc.	USA
Gaofei Sun	Changshu Institute of Technology	P.R. China
Gen Motoyoshi	NEC Corporation	Japan
George Pavlidis	ATHENA Research Center	Greece
Gerino Mappatao	De La Salle University	Philippines
Go Yun Il	Heriot-Watt University Malaysia	Malaysia
Grienggrai Rajchakit	Maejo University	Thailand
Haijun Pan	New Jersey Institute of Technology	USA
Haikal Satria	Universiti Teknologi Malaysia	Malaysia
Hairulazwan Hashim	Universiti Tun Hussein Onn Malaysia	Malaysia
Haitham Abu Ghazaleh	Tarleton State University	USA
Haleh Aghajani	Baylor Scott & White Health	USA
Halil Soken	Japan Aerospace Exploration Agency	Japan
Hamid Alasadi	IRAQ- BASRA	Iraq
Haniza Nahar	Universiti Teknikal Malaysia	Malaysia
Hao Wu	ZTE Corporation	P.R. China
Harikumar Rajaguru	Bannari Amman Institute of Technology	India
Harishchandra Dubey	University of Texas at Dallas	USA

Harry Prabowo	Universitas Gadjah Mada	Indonesia
Hendi Wicaksono	University of Surabaya	Indonesia
Henry Palit	Petra Christian University	Indonesia
Hermawan Hermawan	Diponegoro University	Indonesia
Hussain Saleem	University of Karachi	Pakistan
Idris bin Ismail	Universiti Teknologi PETRONAS	Malaysia
Idris Lim	University of Glasgow	United Kingdom
Imad Mohamad	University of Baghdad	Iraq
Indra Riyanto	Universitas Budi Luhur	Indonesia
Intan Sari Areni	Hasanuddin University	Indonesia
Irfan Allahi	Lahore University of Management Sciences	Pakistan
Iwan Setiawan	Universitas Diponegoro	Indonesia
J Somlal	OppNagarjuna High School, Pedavadlapudi	India
Jamal Hussein	Senior Communication Engineer	United Kingdom
Jana Bhaskara Rao	Anil Neerukonda Institute of Technology and Sciences	India
Jenila Livingston	VIT Chennai	India
Jens Klare	Fraunhofer FHR	Germany
Jiachyi Wu	National Taiwan Ocean University	Taiwan
Jing-Sin Liu	Academia Sinica	Taiwan
Joni Simatupang	President University	Indonesia
José Rufino	Universidade de Lisboa	Portugal
Josip Music	University of Split	Croatia
Juan Carrillo de Gea	University of Murcia	Spain
Juergen Freudenberger	University of Applied Sciences, Konstanz	Germany
Jui-Yuan Lin	Southern Taiwan University of Science and Technology	Taiwan
Julian Webber	Osaka University	Japan
Julio Rojas-Mora	Universidad Austral de Chile	Chile
Kai Zhu	Bell Labs, Nokia	P.R. China
Kamal Chenaoua	King Fahd University of Petroleum & Minerals	Saudi Arabia
Kamal Kant Sharma	Chandigarh University	India
Kamarulafizam Ismail	Universiti Teknologi Malaysia	Malaysia
Karim Al-Saedi	Mustansiriyah University	Iraq
Karim Sebaa	University of Dr Yahia Fares	Algeria
Karthikeyan Ramasamy	Anna University, Chennai	India
Kashif Sharif	Beijing Institute of Technology	P.R. China
Kaveh Ahmadi	University of Toledo	USA
Ke Zeng	Microsoft	USA
Kesavaraja D	Dr Sivanthi Aditanar College of Engineering	India
Kezhi Li	Imperial College London	United Kingdom
Khairul Anuar Mohamad	Universiti Tun Hussein Onn Malaysia	Malaysia
Khairul Munadi	Syiah Kuala University, Faculty of Engineering	Indonesia
Khaled Itani	ISAE Cnam Liban	Lebanon
Khalil Azha Mohd Annuar	Universiti Teknikal Malaysia Melaka	Malaysia

Kittipong Tripetch	Keio University	Japan
Konstantinos Giannakis	Ionian University	Greece
Kotb Basem	Menofia University	Egypt
Kunxia Wang	Hefei University of Technology	P.R. China
Kyungbaek Kim	Chonnam National University	Korea
Lacrimioara Grama	Technical University of Cluj-Napoca	Romania
Lateeef Adesola Akinyemi	Lagos State University, Lagos	Nigeria
Lavish Kansal	Lovely Professional University	India
Lei Liu	City University of Hong Kong	Hong Kong
Liang-Bi Chen	Southern Taiwan University of Science and Technology	Taiwan
Lija Jacob	Saintgits College of Engineering	India
Long Chen	Guangdong University of Technology (GDUT)	P.R. China
Lucio Agostinho	Federal University of Technology - Campus Apucarana	Brazil
Luis Teixeira	Universidade Catolica Portuguesa	Portugal
Lukman Audah	Universiti Tun Hussein Onn Malaysia	Malaysia
M. Fahim Khan	The University of Tokyo	Japan
M. Hassaballah	South Valley University	Egypt
Madhu Ghattamaneni	Sree Vidyanikethan Engineering College	India
Madhur Upadhayay	Shiv Nadar University	India
Magali Rossi	Technical College FATEC	Brazil
Mahmoud Doughan	Lebanese University, Faculty of Engineering, Branch 3	Lebanon
Mahmoud Rokaya	Taif University	Saudi Arabia
Malaoui Abdessamad	Sultan Moulay Slimane University of Beni Mellal	Morocco
Manojkumar Parmar	Robert Bosch Engineering and Solutions Limited	India
Manolo Hina	ECE Paris School of Engineering	France
Manoochehr Nahvi	University of Guilan, Rasht	Iran
Manuel Silva	School of Engineering, Polytechnic Institute of Porto	Portugal
Marcel Wagner	University of São Paulo	Brazil
Marco Guazzone	University of Piemonte Orientale	Italy
Marek Michalski	Poznan University of Technology	Poland
Mark Leeson	University of Warwick	United Kingdom
Marwan Nafea	Universiti Teknologi Malaysia (UTM)	Malaysia
Mas Rina Mustaffa	Universiti Putra Malaysia	Malaysia
Masrullizam Mat Ibrahim	Universiti Teknikal Malaysia Melaka	Malaysia
Maulin Joshi	Gujarat Technological University	India
Maushumi Barooah	Gauhati University	India
Maxime Leclerc	Thales Canada Inc	Canada
Maxwell Dondo	Defence Research & Development Canada	Canada
Mayank Chaturvedi	Graphic Era University	India
Megat Farez Azril Zuhairi	Universiti Kuala Lumpur	Malaysia
Meirista Wulandari	Universitas Indonesia	Indonesia
Meliksah Ozakturk	Iskenderun Technical University	Turkey
Michael McGuire	University of Victoria	Canada

Minghai Feng	Apple	P.R. China
Mochammad Facta	Diponegoro University	Indonesia
Mohamad Faizal Ab Jabal	Universiti Teknologi MARA (Johor)	Malaysia
Mohamad Fauzi Zakaria	Universiti Tun Hussein Onn Malaysia	Malaysia
Mohamad Koteich	Renault-Nissan Alliance	France
Mohamed Moharam	Misr University For Science and Technolgy	Egypt
Mohammad Al-Mashhadani	Al-Maarif University College	Iraq
Mohammad AlOtaibi	Imam University	Saudi Arabia
Mohammad Al-Shabi	University of Sharjah	United Arab Emirates
Mohammad Khaja Shaik	St Ann's College of Engineering and Technology	India
Mohammad Khalily Dermany	Islamic Azad University, Khomein Branch	Iran
Mohammad Nasir Uddin	American International University-Bangladesh	Bangladesh
Mohammed Al-Rayif	King Khalid University	Saudi Arabia
Mohammed Younis	University of Baghdad	Iraq
Mohd Ashraf Ahmad	Universiti Malaysia Pahang	Malaysia
Mohd Daud	Politeknik Sultan Salahuddin Abdul Aziz Shah	Malaysia
Mohd Izhwan Muhamad	Faculty of Engineering, Universiti Putra Malaysia	Malaysia
Mohd Khair Hassan	Universiti Putra Malaysia	Malaysia
Mohd Khairi Mohd Zambri	Universiti Teknikal Malaysia Melaka	Malaysia
Mohd Shahril Ahmad Khiar	Universiti Teknikal Malaysia Melaka	Malaysia
Mohsen Karimzadeh Kiskani	University of California Santa Cruz	USA
Moorthy Veerasamy	Vishnu Institute of Technology	India
Muataz Salih	Flex	Malaysia
Muftah Fraifer	IDC-CSIS-UL	Ireland
Muhamad Fadli Ghani	Universiti Kuala Lumpur Malaysian Institute of Marine Engineering Technology	Malaysia
Muhammad H Jamaluddin	Universiti Teknikal Malaysia Melaka	Malaysia
Muhammad Ishtiaq Ahmad	Beijing Institute of Technology	P.R. China
Muhammad Syafrullah	Universitas Budi Luhur	Indonesia
Muhammad Zahid Tunio	Dawood University Engineering & Technology (DUET)	Pakistan
Mujtaba Mahdi Mudassir Syed	Osmania University	India
Mundukur Bhat	Vignan's University	India
N. Prabaharan	SASTRA Deemed University	India
Nadeem Qazi	Brunel University	United Kingdom
Narottam Das	University of Southern Queensland	Australia
Narumol Chumuang	Muban Chombueng Rajabhat University	Thailand
Nasser Najibi	City University of New York	USA
Naveed Sabir	Mehran Univ. of Engineering & Technology, Jamshoro	Pakistan
Naveen Kumar Rangaraju	JNTU Hyderabad	India
Naveena C	VTU	India
Nibras Faqera	Universiti Sains Malaysia	Malaysia
Nidhal Abass	University of Kufa	Iraq
Nik Rumzi Nik Idris	Universiti Teknologi Malaysia	Malaysia

Nikhil Bhargava	Indian Institute of Technology	India
Nikisha Jariwala	VNSGU	India
Ning Zhao	East China Research Institute of Electronic Engineering	P.R. China
Nisha Mithal	General Management	USA
Norashikin M. Thamrin	University Teknologi MARA	Malaysia
Noraziahtulhidayu Kamarudin	University College of Technology Sarawak	Malaysia
Norizam Sulaiman	Universiti Malaysia Pahang	Malaysia
Norkamruzita Saadon	Universiti Teknologi MARA Terengganu	Malaysia
Nour El Deen Khalifa	Cairo University	Egypt
Nuno Rodrigues	Instituto Politécnico de Bragança	Portugal
Omar Al saif	Mosul University	Iraq
Omar Daoud	Philadelphia University	Jordan
Omer Gul	Middle East Technical University	Turkey
Otavio Lavor	UFERSA	Brazil
Pakawan Pugsee	Chulalongkorn University	Thailand
Pancham Shukla	London Metropolitan University	United Kingdom
Paolo Crippa	Università Politecnica delle Marche	Italy
Paramate Horkaew	Suranaree University of Technology	Thailand
Parameshachari B Divakarachari	Visvesvaraya Technological University	India
Partha Ray	Sikkim University	India
Patrick Ho	Monash University	Malaysia
Pawel Rozga	Lodz University of Technology	Poland
Pedro Gonçalves	Universidade de Aveiro	Portugal
Peter Noel	TSMC	Canada
Peter Roessler	University of Applied Sciences Technikum Wien	Austria
Pierre Tsafack	University of Buea	Cameroon
Prashant Upadhyaya	KCNIT-Banda	India
Priti Rege	College of Engineering, Pune	India
Pujianto Yugopuspito	Universitas Pelita Harapan	Indonesia
Puneet Kumar	Symantec Corp	USA
Punith Kumar M b	University of Mysore	India
Qiu Xue-song	Beijing University of Posts and Telecommunications	P.R. China
Raad Al-Qassas	Princess Sumaya University For Technology	Jordan
Raaed Ibrahim	Foundation of Technical Education	Iraq
Rafael Cepeda	InterDigital Europe Ltd.	United Kingdom
Rafael Marinho	UFPB	Brazil
Raid Daoud	Northern Technical University/Al-Hawija Institute	Iraq
Raj Jaiswal	Galgotias University	India
Rajeev Mathur	Geetanjali Instt of Tech Studies, Udaipur	India
Rajeev Sobti	Lovely Professional University	India
Ramaprabha Ramabadran	SSN College of Engineering	India
Ramesh Singh	DTU Delhi	India
Ramkumar Jaganathan	VLB Janakiammal College of Arts and Science	India

Ramoshweu Lebelo	Vaal University of Technology	South Africa
Rana Al Salman	Al Mustansiriya University	Iraq
Rana Khudhair Ahmed	Al-Rafidain University College	Iraq
Rana Sircar	Ericsson	India
Rasmus Nielsen	Cisco Systems	USA
Raveendranathan Kalathil Chellappan	College of Engineering Thiruvananthapuram	India
Ravi Subban	Pondicherry University, Pondicherry	India
Rayane El Sibai	Sorbonne Université	France
Reena Singh	MIT Manipal	India
Rehan Qureshi	Sir Syed University of Engineering & Technology	Pakistan
Renam da Silva	Universidade Federal do Rio de Janeiro	Brazil
Renliang Gu	Google Inc.	USA
Riccardo Pecori	eCAMPUS University	Italy
Riko Saragih	Maranatha Christian University	Indonesia
Rini Hasanah	Brawijaya University	Indonesia
Robert Pucher	University of Applied Sciences Technikum Wien	Austria
Robert Szabolcsi	Óbuda University	Hungary
Roberto Carlos Herrera Lara	National Polytechnic School	Ecuador
Rodrigo Campos Bortoletto	São Paulo Federal Institute of Education, Science and Technology	Brazil
Rodrigo Montufar-Chaveznava	Facultad de Ingeniería, Universidad Nacional Autonoma de Mexico	Mexico
Roman Senkerik	Tomas Bata University in Zlín, Faculty of Applied Informatics	Czech Republic
Rostyslav Sklyar	Independent Professional	Ukraine
S Kannadhasan	Tamilnadu Polytechnic College	India
S Zafaruddin	Bar-Ilan University	Israel
Saeid Nahavandi	Deakin University	Australia
Safdar Bouk	Kyungpook National University	Korea
Sakena Abdul Jabar	Universiti Malaysia Sarawak	Malaysia
Saman Parvaneh	Philips Research North America	USA
Sandeep Kakde	Y C College of Engineering	India
Santosh Chapaneri	University of Mumbai	India
Sarada Dakua	Hamad Medical Corporation	Qatar
Sarvesh Sharma	BITS-Pilani	India
Scott Trent	IBM Research - Tokyo	Japan
Seng Hansun	Universitas Multimedia Nusantara	Indonesia
Seppo Sirkemaa	University of Turku	Finland
Sergey Makarov	Peter the Greate St. Petersburg Polytechnic University	Russia
Seungchul Ryu	Yonsei University	Korea
Shailendra Singh	University Of California, Riverside	USA
Sharad Mohod	SGB Amravati University Amravati	India
Shashikant Patil	SVKM NMIMS Mumbai India	India

Shibiao Wan	The Hong Kong Polytechnic University	Hong Kong
Shilpa Mehta	FACULTY	India
Shishir Shukla	Amity University	India
Shuang Yin	Google	USA
Smitha K. G.	Nanyang Technological University	Singapore
Srinivasa Rao Balasani	Visakha Institute of Engineering & Technology	India
Srinivasulu Tadisetty	Kakatiya University College of Engineering and Technology	India
Steffen Späthe	Friedrich-Schiller-University Jena	Germany
Su Fong Chien	MIMOS Berhad	Malaysia
Sudhanshu Jha	National Institute of Technology (NIT), Jamshedpur	India
Sükrü Ozan	Izmir Institute of Technology	Turkey
Sumit Waghmare	Utopus Insights	India
Sundararaju Karuppannan	Two Thousand Two Anna University	India
Suneeta Harlapur	Vemana Institute of Technology	India
Sunil Kumar	Mody University of Science and Technology	India
Suraya Mohammad	University Kuala Lumpur - British Malaysian Institute	Malaysia
Suryakanthi Tangirala	Faculty of Business	Botswana
Sutrisno Sutrisno	Diponegoro University	Indonesia
Tadanki Muni	K L University	India
Takeshi Tsuchiya	Suwa University of Science	Japan
Tapodhir Acharjee	Assam University, Silchar	India
Tarun Yadav	Scientific Analysis Group, Defence Research & Development Organisation, Ministry of Defence, GOI	India
TH Sutikno	Institute of Advanced Engineering and Science	Indonesia
Thaksen Parvat	Sinhgad Institute of Technology, Lonavala	India
Thinagaran Perumal	University Putra Malaysia	Malaysia
Thitinan Tantidham	Mahidol University	Thailand
Tianhua Xu	University of Warwick	United Kingdom
Tole Sutikno	Universitas Ahmad Dahlan	Indonesia
Tomoaki Nagaoka	National Institute of Information and Communications Technology	Japan
Toufik Sebbagh	University of Skikda	Algeria
Tresna Dewi	Politeknik Negeri Sriwijaya	Indonesia
Tris Dewi Indraswati	Institut Teknologi Indonesia	Indonesia
V Jyothsna	JNTUH	India
Vahid Khalilzad-Sharghi	Medical Imaging Solutions USA	USA
van Thuan Do	Wolffia AS	Norway
Vasos Vassiliou	University of Cyprus	Cyprus
Victor Ramos	Universidad Autonoma Metropolitana	Mexico
Vikash Bhardwaj	Radha Govind Group of Institutions	India
Vito Veneziano	University of Hertfordshire	United Kingdom
Vivek Kute	R. T. M. Nagpur University, Nagpur	India

Wael Salah	Palestine Technical University - Kadoorie	Palestine
Wassim Alexan	German University in Cairo	Egypt
Xia Li	Qualcomm	USA
Xiangguo Li	Henan University of Technology	P.R. China
Xiaojun Li	Texas A&M University	USA
Ying-Ren Chien	National I-Lan University	Taiwan
Yiting Xia	Facebook Inc.	USA
Yong Sun	Schlumberger	USA
Yoshihiro Ito	Nagoya Institute of Technology	Japan
Yu Wang	Tianjin TEDA cable TV Network Co. Ltd	P.R. China
Yuchun Guo	Beijing Jiaotong University	P.R. China
Yulius Prabowo	Kalbis Institute	Indonesia
Yumnam Jayanta	National Institute of Electronics and Information Technology (Kolkata)	India
Yun Ai	Norwegian University of Science and Technology	Norway
YunWu Zhang	Southeast University	P.R. China
Zaher Haddad	Alaqsa University	Palestine
Zahéra Mekkioui	University of tlemcen	Algeria
Zesheng Chen	IPFW	USA
Zhao Chen	Columbia University	USA
Zhaoquan Gu	Guangzhou University	P.R. China
Zhen Mo	VMware	USA
Zhengwei Hao	MathWorks	USA
Zulfatman Has	University of Muhammadiyah Malang	Indonesia
Zuraini Dahari	Universiti Sains Malaysia	Malaysia

Table of Contents

2018 5th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)

Optimization of Modified Sliding Mode Control for an Electro-Hydraulic Actuator System with Mismatched Disturbance
Mohd Fua'ad Rahmat (Universiti Teknologi Malaysia, Malaysia), Siti Marhainis Othman (University Malaysia Perlis, Malaysia), Sahazati Md Rozali (Universiti Teknikal Malaysia Melaka, Malaysia), Zulfatman Has (University of Muhammadiyah Malang, Indonesia) 1

Learning Motivation increased due to a Relaxed Assessment in a Competitivee-Learning Environment
Muhammad Said Hasibuan (University Gadjah Mada & IBI Darmajaya, Indonesia), Onno W Purbo (IBI Darmajaya & XECUREIT, Indonesia) 7

Factors Affecting Users' Purchase Intention and Attitudes towards Mobile Advertising
Clarita Nainggolan (Faculty of Computer Science Universitas Indonesia, Indonesia), Putu Wuri Handayani (Universitas Indonesia, Indonesia), Fatimah Azzahro (Faculty of Computer Science Universitas Indonesia, Indonesia) 11

Implementation Strategy of Knowledge Management System: A Case of Air Drilling Associates
Siti Hadjar (Universitas Indonesia, Indonesia), Putu Wuri Handayani (Universitas Indonesia, Indonesia), Riri Satria (Universitas Indonesia, Indonesia), Ave Adriana Pinem (Universitas Indonesia, Indonesia) 17

Success Factors of HRIS: A Case of Ministry of State-owned Enterprise
Wita Puspitarini (Universitas Indonesia, Indonesia), Putu Wuri Handayani (Universitas Indonesia, Indonesia), Ave Adriana Pinem (Universitas Indonesia, Indonesia), Fatimah Azzahro (Faculty of Computer Science Universitas Indonesia, Indonesia) 23

The Utilization of Ontology to Support The Results of Association Rule Apriori
Dewi Wardani (Universitas Sebelas Maret, Indonesia), Achmad Khusyaini (Universitas Sebelas Maret, Indonesia) 28

Determination of Router Location for Optimizing Computer Network Using Dominating Set Methods
Nova El Maidah (University of Jember, Indonesia), Ivan Hardja (University of Jember, Indonesia), Slamin Slamin (University of Jember, Indonesia) 34

Evaluating The Semantic Mapping
Dewi Wardani (Universitas Sebelas Maret, Indonesia) 40

Web-based Campus Virtual Tour Application using ORB Image Stitching
Didik Dwi Prasetya (Universitas Negeri Malang, Indonesia), Triyanna Widiyaningtyas (Universitas Negeri Malang, Indonesia), Aji P Wibawa (Indonesia & Universitas Negeri Malang, Indonesia) 46

User Experience Analysis of The Users Babacucu.Com
Ahmad Nurul Fajar (Bina Nusantara University, Indonesia), Ditdit Nugeraha Utama (Bina Nusantara University, Indonesia), Taruna Diyapradana (Bina Nusantara University, Indonesia), Gunawan Wang (Bina Nusantara University, Indonesia) 50

A Measurement Framework for Analyze The Influence of Service Quality and Website Quality on User Sat
Beny Prasetyo (Jember University, Indonesia), Fahrobby Adnan (University of Jember, Indonesia), Shinta Wardhani (Jember University, Indonesia) 56

Quantitative Strategic Planning Matrix Analysis On The Implementation Of Second Screen Technology
Jarot S Suroso (Bina Nusantara University, Indonesia) 62

Investment Analysis of Smart Connected Motorbike in Machine to Machine Application in Indonesia
Jarot S Suroso (Bina Nusantara University, Indonesia) 67

Efficiency and Reliability Performance's of the Bioinformatics Resource Portal
Edy Budiman (Universitas Mulawarman, Indonesia), Haeruddin Haeruddin (Universitas Mulawarman, Indonesia), Andi Tejawati (Universitas Mulawarman, Indonesia) 72

ISO/IEC 9126 Quality Model for Evaluation of Student Academic Portal
Edy Budiman (Universitas Mulawarman, Indonesia), Joan Angelina Widians (Universitas Mulawarman, Indonesia), Masna Wati (Universitas Mulawarman, Indonesia), Novianti Puspitasari (Universitas Mulawarman, Indonesia), Muhammad Firdaus (Universitas Mulawarman, Indonesia), Faza Alameka (Universitas Mulawarman, Indonesia) 78

Measurement of IS/IT Investment on the Implementation of ERP and the Effect on company productivity
Qilbaaini Effendi Muftikhali (University of Jember, Indonesia) 84

The Role of Social User and Social Feature on Recommendation Acceptance in Instagram in Indonesia
Muhammad Aldi Yusron (Universitas Indonesia, Indonesia), Putu Wuri Handayani (Universitas Indonesia, Indonesia), Qorib Munajat (University of Indonesia, Indonesia) 90

Modulation Strategies for Indirect Matrix Converter: Complexity, Quality and Performance
Hendril Satrian Purnama (Universitas Ahmad Dahlan & Institute of Advance Engineering and Science (IAES), Indonesia), Tole Sutikno (Universitas Ahmad Dahlan & Universiti Teknologi Malaysia, Indonesia), Mochammad Facta (Diponegoro University, Indonesia) 97

Sentiment Analysis Based on Appraisal Theory for Assessing Incumbent Electability
Canrakerta Canrakerta (Universitas Indonesia, Indonesia), Pamuji Putro (University of Indonesia, Indonesia), Zikri Irfandi (Universitas Indonesia, Indonesia), Nur Fitriah Ayuning Budi (Universitas Indonesia, Indonesia), Achmad Hidayanto (University of Indonesia, Indonesia) 101

Application for the diagnosis of pneumonia based on Pneumonia Severity Index (PSI) values
Elyza Wahyuni (University of Islam Indonesia, Indonesia), Ahmad Ramadhan (University of Islam Indonesia, Indonesia) 107

Impact of Matrix Factorization and Regularization Hyperparameter on a Recommender System for Movies
Gess Fathan (Universitas Gadjah Mada, Indonesia) 113

Object Detection of Omnidirectional Vision Using PSO-Neural Network for Soccer Robot
Novendra Setyawan (University of Muhammadiyah Malang, Indonesia), Nuralif Mardiyah (University of Muhammadiyah Malang, Indonesia), Zulfatman Has (University of Muhammadiyah Malang, Indonesia), Nurhadi I (University of Muhamadiyah Malang, Indonesia), Khusnul Hidayat (University of Muhamadiyah Malang, Indonesia) 117
DSS Scheme Using Forward Chaining-Simple Multi Attribute Rating Technique For Cocoa Beans Selection
Januar Adi Putra (Universitas Jember, Indonesia), Agustinus Galwargan (Universitas Jember, Indonesia), Nelly Adiwijaya (Universitas Jember, Indonesia) 122
CountNet: End to End Deep Learning for Crowd Counting
Bryan Wilie (Bandung Institute of Technology, Indonesia), Samuel Cahyawijaya (Institut Teknologi Bandung & Prosa, Indonesia), Widyawardana Adiprawita (Institut Teknologi Bandung, Indonesia) 128
Robust Principal Component Analysis for Feature Extraction of Fire Detection System
Herminarto Nugroho (Universitas Pertamina, Indonesia), Muhammad Koyimatu (Pertamina University, Indonesia), Ade Irawan (Universitas Pertamina, Indonesia), Ariana Yunita (Universitas Pertamina, Indonesia) 133
Sarcasm Detection on Indonesian Twitter Feeds
Dwi Rahayu (University of Muhammadiyah Malang, Indonesia), Soveatin Kuntur (University of Muhammadiyah Malang, Indonesia), Nur Hayatin (Universitas Muhammadiyah Malang, Indonesia) 137
Aspect Based Sentiment Analysis approach with CNN
Budi Mukhamad Mulyo (Institute Teknologi Bandung & ITB, Indonesia), Dwi H Widyantoro (Institut Teknologi Bandung, Indonesia) 142
Optimal ANFIS Model for Forecasting System Using Different FIS
Deasy Adyanti (Universitas Islam Negeri Sunan Ampel Surabaya, Indonesia), Dian Candra Rini Novitasari (Universitas Islam Negeri Sunan Ampel, Indonesia), Ahmad Hanif Asyhar (Universitas Islam Negeri Sunan Ampel, Indonesia), Fajar Setiawan (Perak Maritime Meteorology Station II Surabaya, Indonesia) 148
Automated Diagnosis System of Diabetic Retinopathy Using GLCM Method and SVM Classifier
Ahmad Zoebad Foeady (UIN Sunan Ampel Surabaya, Indonesia), Dian Candra Rini Novitasari (Universitas Islam Negeri Sunan Ampel, Indonesia), Ahmad Hanif Asyhar (Universitas Islam Negeri Sunan Ampel, Indonesia), Muhammad Firmansjah (Airlangga University, Indonesia) 154
Development of Discrete-Cockroach Algorithm (DCA) for Feature Selection Optimization
Yusuf Hendrawan (Universitas Brawijaya, Indonesia), Muchnuria Rachmawati (Universitas Brawijaya, Indonesia), Muchammad Fauzy (Institut Teknologi Sepuluh November, Indonesia) 161
Narrow Window Feature Extraction for EEG-Motor Imagery Classification using k-NN and Voting Scheme
Adi Wijaya (Universitas Gadjah Mada, Indonesia, Indonesia), Teguh Bharata Adji (Universitas Gadjah Mada, Indonesia), Noor Akhmad Setiawan (Universitas Gadjah Mada, Indonesia) 167
Emotion Recognition using Fisher Face-based Viola-Jones Algorithm
Kartika Candra Kirana (State University of Malang, Indonesia), Slamet Wibawanto (State University of Malang, Indonesia), Heru Wahyu Herwanto (State University of Malang, Indonesia) 173
Indonesian Id Card Recognition using Convolutional Neural Networks
M. Octaviano Pratama (Premier Optima, Indonesia), Wira Satyawan (Premier Optima, Indonesia), Bagus Fajar (Premier Optima, Indonesia), Haris Hamzah (Premier Optima, Indonesia), Rusnandi Fikri (Premier Optima, Indonesia) 178
Sizing Optimization And Operational Strategy Of HRES (PV-WT) Using Differential Evolution Algorithm
Ilham Pakaya (Universitas Muhammadiyah Malang, Indonesia), Zulfatman Has (University of Muhammadiyah Malang, Indonesia), Annas Alif Putra (Universitas Muhammadiyah Malang, Indonesia) 182
A Survey on Topologies and Controls of Z-Source Matrix Converter
Tri Wahono (Ahmad Dahlan University, Indonesia), Tole Sutikno (Universitas Ahmad Dahlan & Universiti Teknologi Malaysia, Indonesia), Nuryono Widodo (Universitas Ahmad Dahlan, Indonesia), Mochammad Facta (Diponegoro University, Indonesia) 189
A New Algorithm for Designing the Parameter of Damped-Type Double Tuned Filter
Haposan Yoga Pradika Napitupulu (Universitas Trisakti, Indonesia), Chairul Gagarin Irianto (Universitas Trisakti, Indonesia) 193
Power Demand Forecasting Considering Actual Peak Load Periods Using Artificial Neural Network
Yuan Octavia DP (Universitas Negeri Malang, Indonesia), AN Afandi (Universitas Negeri Malang, Indonesia & Kumamoto University, Japan), Hari Putranto (Universitas Negeri Malang, Indonesia) 198
Comparison of LFC Optimization on Micro-hydro using PID, CES, and SMES based Firefly Algorithm
Kadaryono Kadaryono (Universitas Darul Ulum, Jombang, Indonesia), Rukslin Rukslin (Universitas Darul Ulum & Universitas Islam Sultan Agung, Indonesia), Machrus Ali (Universitas Darul Ulum, Jombang & Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia), Asnun Parwanti (Universitas Darul Ulum, Jombang, Indonesia), Iwan Cahyono (Universitas Darul Ulum, Jombang, Indonesia) 204
Optimal Power Flow using Fuzzy-Firefly Algorithm
Dwi Lastomo (Teknik Elektro Otomasi Institut Teknologi Sepuluh Nopember Surabaya & ITS Surabaya, Indonesia), Widodo Widodo (University of PGRI Adi Buana Surabaya, Indonesia), Herlambang Setiadi (The University of Queensland, Australia) 210
Low-Frequency Oscillation Mitigation using an Optimal Coordination of CES and PSS based on BA
Dwi Lastomo (Teknik Elektro Otomasi Institut Teknologi Sepuluh Nopember Surabaya & ITS Surabaya, Indonesia), Herlambang Setiadi (The University of Queensland, Australia), Galih Bangga (University of Stuttgart, Germany), Muhammad Faisal (PT. Schindler, Indonesia), Go Hutomo (Institut Teknologi Sepuluh Nopember, Indonesia), Imam Farid (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia), Taurista Syawitri (Universitas Muhammadiyah Surakarta, Indonesia), Louis Putra (Politecnico di Milano, Italy), Yongki Hendranata (Texas A&M University College Station, USA), Kristiadi Stefanus (Imperial College London, Indonesia), Chairunnisa Chairunnisa (Politeknik Penerbangan Surabaya, Indonesia), Andri Ashfahani (Institut Teknologi Sepuluh Nopember, Indonesia), Ahmad Sabila (Universitas Brawijaya, Indonesia) 216

Computer Aided Model for an Off-grid Photovoltaic System using Batteries Only
Emil Lazarescu (Politehnica University Timisoara, Romania), Mihaela Friqura-Iliasa (Politehnica University Timisoara, Romania), Flaviu Friqura-Iliasa (Politehnica University Timisoara & National Institute for Research. and Development in Electrochemistry and Condensed Matter/LERF, Timisoara, Romania), Lia Dolqa (Politehnica University Timisoara, Romania), Marius Mirica (Nat. Institute for Res. and Dev. in Electrochemistry and Condensed Matter, Romania), Hannelore Filipescu (Politehnica University Timisoara, Romania) 222
Computer Aided Model for a Low Voltage Varistor with Increased Thermal Stability
Mihaela Friqura-Iliasa (Politehnica University Timisoara, Romania), Flaviu Friqura-Iliasa (Politehnica University Timisoara & National Institute for Research. and Development in Electrochemistry and Condensed Matter/LERF, Timisoara, Romania), Lia Dolqa (Politehnica University Timisoara, Romania), Florin Balcu (Nat. Institute for Res. and Dev. in Electrochemistry and Condensed Matter, Romania), Hannelore Filipescu (Politehnica University Timisoara, Romania), Adrian Olariu (Politehnica University Timisoara, Romania) 226
Economic Feasibility Study of Rooftop Grid Connected PV System for Peak Load Reduction
Syafii Syafii (University of Andalas, Indonesia), Novizon Novizon (Universitas Andalas, Indonesia), Wati Wati (STKIP PGRI Sumatera Barat, Indonesia), Dona Juliandri (Universitas Andalas, Indonesia) 231
Automatic Switching Algorithm for Photovoltaic Power Generation System
Ivan Husain (Universitas Indonesia, Indonesia), Canny Dahlia (Universitas Indonesia, Indonesia), Feri Yusivar (Universitas Indonesia, Indonesia) 236
Rotor Speed Control Maximum Power Point Tracking for Small Wind Turbine
Ni Luh Dharmaraditya (University of Indonesia, Indonesia), Lazarus Stefan (University of Indonesia, Indonesia), Feri Yusivar (Universitas Indonesia, Indonesia) 243
Stator Flux Oriented Control of Three-Phase Induction Motor with Improved Decoupling Scheme
Irvan Arif (Universitas Indonesia, Indonesia), Bernadeta Harini (Universitas Indonesia, Indonesia), Feri Yusivar (Universitas Indonesia, Indonesia) 249
Sensorless PMSM Control using Fifth Order EKF in Electric Vehicle Application
Nanda Avianto Wicaksono (Universitas Indonesia, Indonesia), Bernadeta Wuri Harini (Universitas Indonesia, Indonesia), Feri Yusivar (Universitas Indonesia, Indonesia) 254
Smart Frequency Control using Coordinated RFB and TCPS based on Firefly Algorithm
Dwi Lastomo (Teknik Elektro Otomasi Institut Teknologi Sepuluh Nopember Surabaya & ITS Surabaya, Indonesia), Arif Musthofa (Institut Teknologi Sepuluh Nopember, Indonesia), Herlambang Setiadi (The University of Queensland, Australia), Eddy Setyo Koenhardono (Institut Teknologi Sepuluh Nopember, Indonesia), Muhammad Djalal (State Polytechnic of Ujung Pandang, Indonesia) 260
Rain Attenuation Statistics over 5G Millimetre Wave Links in Malaysia
Mustafa Ghanim (Universiti Teknologi Malaysia, Malaysia), Manhal Alhilali (Universiti Teknologi Malaysia, Malaysia), Jafri Din (Universiti Teknologi Malaysia, Malaysia), Hong Yin Lam (Universiti Tun Hussein Onn Malaysia, Malaysia) 266
UUID Beacon Advertisements For Lecture Schedule Information
Wiwin Kristiana (Universitas Narotama, Indonesia), Mochammad Mizanul Achlaq (Universitas Narotama, Indonesia), Benediktus Anindito (Universitas Narotama, Indonesia), Aryo Nugroho (Institut Teknologi Sepuluh Nopember & Universitas Narotama, Indonesia), Cahyo Darujati (Narotama University, Indonesia), Moh Noor Al-Azam (Universitas Narotama & Rahajasa Media Internet, PT., Indonesia) 270
Comparative Performance Analysis of Linear Precoding in Downlink Multi-user MIMO
Subuh Pramono (Universitas Sebelas Maret, Indonesia) 277
Application of LoRa WAN Sensor and IoT for Environmental Monitoring in Riau Province Indonesia
Evizal Abdul Kadir (Universitas Islam Riau, Indonesia), Akmar Efendi (University of Islam Riau, Indonesia), Sri Listia Rosa (Universitas Islam Riau, Indonesia) 281
Co-channel Interference Monitoring based on Cognitive Radio Node Station
Arief Marwanto (Universiti Islam Sultan Agung (UNISSULA) Semarang, Indonesia), Ulin Nuha (Faculty of Industrial Engineering, Indonesia), Jenny Hapsari (Faculty of Industrial Engineering, Indonesia), Daniel Triswahyudi (PT. Hartono Istana Teknologi (Polytron), Indonesia) 286
Simulation of Mobile LoRa Gateway for Smart Electricity Meter
Sugianto Sugianto (University of Indonesia, Indonesia), Azwar Anhar (University of Indonesia, Indonesia), Ruki Harwahyu (Universitas Indonesia & Universitas Indonesia, Indonesia), Riri Fitri Sari (University of Indonesia, Indonesia) 292
Fuzzy Logic Controller Design for Leader-Follower Robot Navigation
Tresna Dewi (Politeknik Negeri Sriwijaya, Indonesia), Yudi Wijanarko (Politeknik Negeri Sriwijaya, Indonesia), Pola Risma (Sriwijaya Polytechnic, Indonesia), Yurni Oktarina (Polytechnic Sriwijaya Palembang-Indonesia, Indonesia) 298
Arm Robot Manipulator Design and Control for Trajectory Tracking; a Review
Hendra Yudha (Universitas Tridinanti Palembang, Indonesia), Tresna Dewi (Politeknik Negeri Sriwijaya, Indonesia), Pola Risma (Sriwijaya Polytechnic, Indonesia), Yurni Oktarina (Polytechnic Sriwijaya Palembang-Indonesia, Indonesia) 304
Magnetorheological Elastomer Stiffness Control for Tunable Vibration Isolator
Giqih Priyandoko (Universitas Widyagama, Malang, Indonesia), Tedi Kurniawan (FKM, UMP, Malaysia), Efistein Naga (FKM, UMP, Malaysia) 310
Improving a Wall-Following Robot Performance with a PID-Genetic Algorithm Controller
Andi Adriansyah (Universitas Mercu Buana, Indonesia), Heru Suwoyo (Shanghai University, P.R. China), Yingzhong Tian (Shanghai University, P.R. China), Chenwei Deng (Beijing Institute of Technology, P.R. China) 314
A Review of Solar Tracker Control Strategies
Ali Basrah Pulungan (Universitas Negeri Padang, Indonesia), Lovely Son (Universitas Andalas, Indonesia), Syafii Syafii (University of Andalas, Indonesia) 319
Robust and Accurate Positioning Control of Solar Panel System Tracking based Sun Position Image
Zulfatman Has (University of Muhammadiyah Malang, Indonesia), Lailis Syafa'ah (University of Muhammadiyah Malang, Indonesia), Lailatul Fauziyah (University of Muhammadiyah Malang, Indonesia) 324

Robust Adaptive Sliding Mode Control Design with Genetic Algorithm for Brushless DC Motor
Zulfatman Has (University of Muhammadiyah Malang, Indonesia), Machmud Effendy, ME (University of Muhammadiyah Malang, Indonesia), Een Putra (University of Muhammadiyah Malang, Indonesia) 330
Active Fault Tolerance Control for Sensor Fault Problem in Wind Turbine Using SMO with LMI Approach
Nuralif Mardiyah (University of Muhammadiyah Malang, Indonesia), Novendra Setyawan (University of Muhammadiyah Malang, Indonesia), Zulfatman Has (University of Muhammadiyah Malang, Indonesia), Bella Retno (University of Muhamadiyah Malang, Indonesia) 336
Vibration Control of Magnetorheological Elastomer Beam Sandwich
Gigih Priyandoko (Universitas Widyagama, Malang, Indonesia), Tedi Kurniawan (FKM, UMP, Malaysia), Saffirna Mohd Soffie (FKM, UMP, Malaysia) 341
Measurement of Thermal Expansion Coefficient on Electric Cable Using X-Ray Digital Microradiography
Yessi Affriyenni (State University of Malang, Indonesia), Gede Bayu Suparta (Gadjah Mada University, Indonesia), Galandaru Swalaganata (Institut Agama Islam Negeri Tulungagung, Indonesia) 345
Review on Adjustable Speed Drive Techniques of Matrix Converter Fed Three-Phase Induction Machine
Arsyad Cahya Subrata (Universitas Ahmad Dahlan, Indonesia), Tole Sutikno (Universitas Ahmad Dahlan & Universiti Teknologi Malaysia, Indonesia), Aiman Zakwan Jidin (Universiti Teknikal Malaysia Melaka, Malaysia), Auzani Jidin (Universiti Teknikal Malaysia Melaka, Malaysia) 350
Indoor Agriculture: Measurement of The Intensity of LED for Optimum Photosynthetic Recovery
Benediktus Anindito (Universitas Narotama, Indonesia), Adri Gabriel Sooai (Institut Teknologi Sepuluh Nopember & Universitas Katolik Widya Mandira, Indonesia), Mochammad Mizanul Achlaq (Universitas Narotama, Indonesia), Moh Noor Al-Azam (Universitas Narotama & Rahajasa Media Internet, PT., Indonesia), Aris Winaya (Universitas Muhammadiyah Malang, Indonesia), Maftuchah Maftuchah (Universitas Muhammadiyah Malang, Indonesia) 356
Quasi Z-Source Inverter as MPPT on Renewable Energy using Grey Wolf Technique
Quota Alief Sias (Universitas Negeri Malang, Indonesia), Irham Fadlika (Universitas Negeri Malang, Indonesia), Irawan Dwi Wahyono (Universitas Negeri Malang, Indonesia), AN Afandi (Universitas Negeri Malang, Indonesia & Kumamoto University, Japan) 362
Analysis of Waveform of Partial Discharge in Air Insulation Measured by RC Detector
Michael Stevano Sinurat (Insitut Teknologi Bandung, Indonesia), Umar Khayam (Institut Teknologi Bandung, Indonesia) 367
Application of Ultra-Wideband Double Layer Printed Antenna for Partial Discharge Detection
Yuda Hamdani (Institut Teknologi Bandung, Indonesia), Umar Khayam (Institut Teknologi Bandung, Indonesia) 373
Reliability Analysis of Randu Garut 3 Distribution System Using Section Technique Method
Jimmy Putra (Universitas Gadjah Mada, Indonesia), Raka Bagus (Universitas Gadjah Mada, Indonesia) 379
Combined Computational Intelligence Approach for the Power System Optimization Problem
Arif Afandi (UM, Indonesia), Irham Fadlika (Universitas Negeri Malang, Indonesia), Langlang Gumilar (Universitas Negeri Malang, Indonesia), Yuni Rahmawati (Universitas Negeri Malang, Indonesia), Quota Alief Sias (Universitas Negeri Malang, Indonesia), Irawan Dwi Wahyono (Universitas Negeri Malang, Indonesia), Yunis Sulistyorini (IKIP Budi Utomo, Indonesia), Farrel Candra WA (Research Center of Smart Power and Energy Systems, Indonesia), Michiko Ryuu Sakura A (Research Center of Smart Power and Energy Systems, Indonesia) 385
Partial Discharge and Breakdown Strength of Plasma Treated Nanosilica/LDPE Nanocomposites
Muhammad Abu Bakar Sidik (Faculty of Engineering, Universitas Sriwijaya Ogan Ilir, Indonesia), Mohd Hafizi Ahmad (Universiti Teknologi Malaysia, Malaysia), Zainuddin Nawawi (Universitas Sriwijaya, Indonesia), Muhammad Irfan Jambak (Faculty of Engineering, Universitas Sriwijaya Ogan Ilir, Malaysia), Aulia Aulia (Universitas Andalas, Indonesia), Eka Waldi (Andalas University, Indonesia), Zulkurnain Abdul-Malek (University Technology Malaysia, Malaysia), Noor 'Aliaa Awang (Universiti Teknologi Malaysia, Malaysia) 391
Shortest Route at Dynamic Location with Node Combination-Dijkstra Algorithm
Achmad Fitro (Jl. Imam Bardjo SH No. 5 Semarang & Universitas Diponegoro, Indonesia), Suryono Suryono (Faculty of Science and Mathematics Diponegoro University, Indonesia), Retno Kusumaningrum (Diponegoro University, Indonesia) 395
Analysis of Consumer Confidence on Mobile Commerce in Indonesia
Andhika Prabawati (Universitas Atma Jaya Yogyakarta, Indonesia), I Putu Widyana (Atma Jaya University Yogyakarta, Indonesia), Suyoto Suyoto (Universitas Atma Jaya Yogyakarta, Indonesia) 400
Social Media and User Performance in Knowledge Sharing
Setiawan Assegaff (STIKOM Dinamika Bangsa & ISRG STIKOM DB, Indonesia), Akwan Sunoto (STIKOM Dinamika Bangsa, Indonesia) 405
Analysis of Electronic Medical Record Reception using Expanded Technology Acceptance Model
Indra Kharisma Raharjana (Universitas Airlangga, Indonesia), Faisal Apriyana (Universitas Airlangga, Indonesia), Taufik Taufik (Universitas Airlangga, Indonesia) 411
Development of Mobile Based Educational Game as Learning Media for Basic Programming in VHS
Hakkun Elmunsyah (Universitas Negeri Malang, Indonesia), Gradiyanto Radityo Kusumo (Universitas Negeri Malang, Indonesia), Utomo Pujianto (Universitas Negeri Malang, Indonesia), Didik Dwi Prasetya (Universitas Negeri Malang, Indonesia) 416
Incident and Service Request Management for Academic Information System based on COBIT
Indra Kharisma Raharjana (Universitas Airlangga, Indonesia), Ibnu Ibadillah (Universitas Airlangga, Indonesia), Purbandini Purbandini (Universitas Airlangga, Indonesia), Eva Hariyanti (Institut Teknologi Sepuluh Nopember, Indonesia) 421
Applying IT Services Business Relationship Management on Security Outsource Company
Indra Kharisma Raharjana (Universitas Airlangga, Indonesia), Susmiandri Susmiandri (Universitas Airlangga, Indonesia), Army Justitia (Universitas Airlangga, Indonesia) 426
PSS Design Based on Fuzzy Controller with Particle Swarm Optimization Tuning
Ermanu Azizul Hakim (University of Muhammadiyah Malang, Indonesia), Nur Kasan (University of Muhammadiyah Malang, Indonesia), Nurhadi Nurhadi (University of Muhammadiyah Malang, Indonesia) 432

OCT for non-destructive examination of the internal biological structures of mosquito specimen
Naresh Kumar Ravichandran (Kyungpook National University, Korea), Deokmin Jeon (Kyungpook National University, Korea), Junsoo Lee (Kyungpook National University, Korea), Jaeseok Park (Kyungpook National University, Korea), Byeonggyu Jeon (Kyungpook National University, Korea), Sangbong Lee (Kyungpook National University, Korea), Pilun Kim (Kyungpook National University, Korea), Kwang Shik Choi (Kyungpook National University, Korea), Hee-Young Jung (Kyungpook National University, Korea), Byoung-Ju Yun (Kyungpook National University & IT College, Korea), Mansik Jeon (Kyungpook National Univerisity, Korea), Jeehyun Kim (Kyungpook National University, Korea) 436
Analysis of EMG based Arm Movement Sequence using Mean and Median Frequency
Basri Cahyadi (University Malaysia Perlis, Malaysia), Wan Khairunizam Wan Ahmad (University Malaysia Perlis & Motion, Signal, Image Processing and Pattern Recognition Research Group, Malaysia), Zunaidi Ibrahim (University Malaysia Perlis, Malaysia), Shahriman Abu Bakar (Universiti Malaysia Perlis, Malaysia), Zuradzman Mohamad Razlan (Universiti Malaysia Perlis, Malaysia), Mohd Rudzuan Mohd Nor (Universiti Malaysia Perlis, Malaysia) 440
Implementation of Myo Armband on Mobile Application for Post-stroke Patient Hand Rehabilitation
Tri Bintang Dewantoro (Politeknik Elektronika Negeri Surabaya, Indonesia), Riyanto Sigit (Politeknik Elektronika Negeri Surabaya, Indonesia), Heny Yuniarti (Politeknik Elektronika Negeri Surabaya, Indonesia), Yudith Dian Prawitri (Rumah Sakit Universitas Airlangga, Indonesia), Fridastya Andini Pamudyaningrum (Politeknik Elektronika Negeri Surabaya, Indonesia), Mahaputra Ilham Awal (Politeknik Elektronika Negeri Surabaya, Indonesia) 445
Development of Embedded System for Centralized Insomnia System
Novi Azman (Universitas Nasional & Universiti Teknikal Malaysia Melaka, Indonesia), Mohd Khanapi Abd Ghani (Universiti Teknikal Malaysia Melaka, Malaysia), Haikal Satria (Universiti Teknologi Malaysia, Malaysia), Muhammad Zillullah Mukaram (Universiti Teknologi Malaysia, Malaysia) 451
Performance Analysis of Color Cascading Framework on Two Different Classifiers in Malaria Detection
Cucun Very Angkoso (University of Trunojoyo Madura, Indonesia), Yonathan Ferry Hendrawan (University of Trunojoyo Madura, Indonesia), Ari Kusumaningsih (University of Trunojoyo Madura, Indonesia), Rima Tri Wahyuningrum (University of Trunojoyo Madura, Indonesia) 456
Monitoring Walking Devices For Calorie Balance In Patients With Medical Rehabilitation Needs
Wahyu Andhyka Kusuma, WAK (Universitas Muhammadiyah Malang, Indonesia), Zamah Sari (Universitas Muhammadiyah Malang, Indonesia), Diah Fitriani (Universitas Muhammadiyah Malang, Indonesia), Siti Norhabibah (Universitas Muhammadiyah Malang, Indonesia), Sabrina Ubay (Universitas Muhammadiyah Malang, Indonesia), Hardianto Wibowo (Universitas Muhammadiyah Malang, Indonesia) 460
E-Government Maturity Model to Support System Dynamics in Public Policymaking
Feldiansyah Nasution (Universiti Teknologi Malaysia & PT. Bumi Siak Pusako, Indonesia) 464
Comparative Analysis of Forensic Software on Android-based Blackberry Messenger using NIJ Framework
Imam Riadi (Universitas Ahmad Dahlan, Indonesia, Indonesia), Sunardi Sunardi (Universitas Ahmad Dahlan, Indonesia), Arizona Firdonsyah (Universitas Ahmad Dahlan, Indonesia) 472
Semi-reactive Switch Based Proxy ARP in SDN
Fauzi Dwi Setiawan Sumadi (University of Muhammadiyah Malang, Indonesia), Diah Risqiwati (University of Muhammadiyah Malang, Indonesia), Syaifuddin Syaifuddin (University of Muhammadiyah Malang, Indonesia) 478
Improvement of Cluster Importance Algorithm with Sentence Position for News Summarization
Nur Hayatin (Universitas Muhammadiyah Malang, Indonesia), Gita Marthasari (Universitas Muhammadiyah Malang, Indonesia) 483
Comparison Between A And Obstacle Tracing Pathfinding In Gridless Isometric Game*
Lailatul Husniah (Universitas Muhammadiyah Malang, Indonesia), Rizky Ade Mahendra (Universitas Muhammadiyah Malang, Indonesia), Ali Sofyan Kholimi (Universitas Muhammadiyah Malang, Indonesia), Eko Budi Cahyono (Universitas Muhammadiyah Malang, Indonesia) 489
Automatic Game World Generation for Platformer Games Using Genetic Algorithm
Ali Sofyan Kholimi (Universitas Muhammadiyah Malang, Indonesia), Ahmad Hamdani (Universitas Muhammadiyah Malang, Indonesia), Lailatul Husniah (Universitas Muhammadiyah Malang, Indonesia) 495
Middleware for Network Interoperability in IoT
Eko Sakti Pramukantoro (Brawijaya University, Indonesia), Fariz Andri Bakhtiar (Brawijaya University, Indonesia), Binariyanto Aji (Brawijaya University, Indonesia), Rasidy Pratama (Brawijaya University, Indonesia) 499
Face RGB-D Data Acquisition System Architecture for 3D Face Identification Technology
Aldi Bayu Kreshnanda Ismail (Politeknik Elektronika Negeri Surabaya, Indonesia), Ihsan Fikri Abdurahman Muharram (Politeknik Elektronika Negeri Surabaya, Indonesia), Dadet Pramadihanto (PENS, Indonesia), Adnan Rachmat Anom Besari (Politeknik Elektronika Negeri Surabaya (PENS) & Electronic Engineering Polytechnic Institute of Surabaya (EEPIS), Indonesia) 503
Feature Expansion for Sentiment Analysis in Twitter
Erwin B. Setiawan (Telkom University, Indonesia), Dwi H Widyantoro (Institut Teknologi Bandung, Indonesia), Kridanto Surendro (Institu Teknologi Bandung, Indonesia) 509
Individual Factors As Antecedents of Mobile Payment Usage
Radinal Setyadinsa (Faculty of Computer Science, Universitas Indonesia, Indonesia), Muhammad Rifki Shihab (Faculty of Computer Science, Universitas Indonesia, Indonesia), Yudho Sucahyo (University of Indonesia, Indonesia) 514
Determine supporting features for mobile application of NUSANTARA
Dana Sensuse (Laboratory of E-Government, Indonesia), Ika Arthalia Wulandari (University of Indonesia, Indonesia), Erzi Hidayat (University of Indonesia, Indonesia), Elin Cahyaningsih (University of Indonesia & Badan Kepegawaian Negara, Indonesia), Pristi Sukmasetya (Universitas Indonesia, Indonesia), Wina Permana Sari (Bina Nusantara Institute of Creative Technology Malang, Indonesia) 519
Knowledge Management Maturity Assessment in Air Drilling Associates using G-KMMM
Dana Sensuse (Laboratory of E-Government, Indonesia), Richard Vinc (Universitas Indonesia, Indonesia), Ricky Ruliputra (Universitas Indonesia, Indonesia), Siti Hadjar (Universitas Indonesia, Indonesia), Sofian Lusa (University of Indonesia, Indonesia), Pudy Prima (Universitas Indonesia, Indonesia) 525

Measuring Knowledge Management Readiness of Indonesia Ministry of Trade
Dana Sensuse (Laboratory of E-Government, Indonesia), Jani Sireqar (Universitas Indonesia, Indonesia), Ronny Ansis (Universitas Indonesia, Indonesia), Sofian Lusa (University of Indonesia, Indonesia), Pudy Prima (Universitas Indonesia, Indonesia) 531
Personal Extreme Programming with MoSCoW Prioritization for Developing Library Information System
Gita Marthasari (Universitas Muhammadiyah Malang, Indonesia), Wildan Suharso (Universitas Muhammadiyah Malang, Indonesia) 537
Analysis on Customer Satisfaction Dimensions in P2P Accommodation using LDA: A Case Study of Airbnb
Kevin Situmorang (Universitas Indonesia, Indonesia), Achmad Hidayanto (University of Indonesia, Indonesia), Alfan Wicaksono (Universitas Indonesia, Indonesia), Arlisa Yuliawati (Universitas Indonesia, Indonesia) 542
IDEnet: Inception-Based Deep Convolutional Neural Network for Crowd Counting Estimation
Samuel Cahyawijaya (Institut Teknologi Bandung & Prosa, Indonesia), Bryan Wilie (Bandung Institute of Technology, Indonesia), Widyawardana Adiprawita (Institut Teknologi Bandung, Indonesia) 548
Multispectral Imaging and Convolutional Neural Network for Photosynthetic Pigments Prediction
Kestrilia Prilianti (Universitas Ma Chung, Indonesia) 554
Substrate Integrated Waveguide Bandpass Filter with Complementary Split Ring Resonator at 2.45 GHz
Dian Widi Astuti (Universitas Mercu Buana, Indonesia), Mudrik Alaydrus (Universitas Mercu Buana, Indonesia) 560
ML-Optimized Beam-based Radio Coverage Processing in IEEE 802.11 WLAN Networks
Mehdi Guessous (Mohammadia Engineering School, Morocco), Lahbib Zenkouar (Mohammadia Engineering School, Morocco) 564
Single-Tone Doppler Radar System for Human Respiratory Monitoring
Rizky Ambarini (Telkom University, Indonesia), Aloysius Adya Pramudita (Telkom University, Indonesia), Erfansyah Ali (Telkom University, Indonesia), Antonius Setiawan (Telkom University, Indonesia) 571
Dual Frequency Continuous Wave Radar for Small Displacement Detection
Andarining Palupi (Telkom University, Indonesia), Aloysius Adya Pramudita (Telkom University, Indonesia), Dharu Arseno (Telkom University, Indonesia), Antonius Setiawan (Telkom University, Indonesia) 576
A New Method for Minimizing the Unnecessary Handover in High-Speed Scenario
Hoe Tung Yew (Universiti Malaysia Sabah, Malaysia), Haikal Satria (Universiti Teknologi Malaysia, Malaysia), Rindu Nurma Illahi (Universiti Teknologi Malaysia, Malaysia) 580
Automate Snort Rule For Xss Detection With Honeypot
Syaifuddin Syaifuddin (University of Muhammadiyah Malang, Indonesia), Hanugra Sidharta (BINA NUSANTARA Institute of Creative Technology, Indonesia), Diah Risqiwati (University of Muhammadiyah Malang, Indonesia) 584
Re-Ranking Image Retrieval on Multi Texton Co-Occurrence Descriptor Using K-Nearest Neighbor
Yufis Azhar (Universitas Muhammadiyah Malang, Indonesia), Agus Eko Minarno (Universitas Muhammadiyah Malang, Indonesia), Yuda Munarko (Universitas Muhammadiyah Malang, Indonesia) 589
Monitoring The Usage of Marine Fuel Oil Aboard Ketapang Gilimanuk Ship
Arief Marwanto (Universiti Islam Sultan Agung (UNISSULA) Semarang, Indonesia), Sarman Sarman (Marine Merchant Academy of Surabaya, Indonesia), Suryani Alifah (Unissula University, Indonesia) 594
Design of Low Noise Micro Liter Syringe Pump for Quartz Crystal Microbalance Sensor
Ridha Ikhsani (Brawijaya University, Indonesia), Dionysius J D H Santjojo (University of Brawijaya, Indonesia), Setyawan Sakti (Brawijaya University, Indonesia) 598
Implementation of the Culinary Recommendation System Using Sentiment Analysis and SAW in Bengkulu
Yudi Setiawan (University of Bengkulu, Indonesia), Boko Susilo (University of Bengkulu, Indonesia), Aan Erlansari (Bengkulu University & Jl. Wr. Supratman Kandang Limun Bengkulu, Indonesia), Sumitra Firdaus (University of Bengkulu, Indonesia), Evi Maryanti (University of Bengkulu, Indonesia) 603
Appropriate Sets of Criteria for Innovation Adoption of IS Security in Organizations
Sandy Kosasi (STMIK Pontianak, Indonesia), Vedyanto Vedyanto (Santu Petrus Junior High School, Indonesia), I Dewa Ayu Eka Yuliani (STMIK Pontianak, Indonesia) 608
Self-Efficacy a Critical Factor of Information System: An Investigation using DeLone McLean
Tri Lathif Mardi Suryanto (Universitas Pembangunan Nasional Veteran JawaTimur, Indonesia), Djoko Budiyanto Setyohadi (Universitas Atma Jaya Yogyakarta, Indonesia), Akhmad Fauzi (Universitas Pembangunan Nasional Veteran JawaTimur, Indonesia) 614
Improvement of Information Technology Infrastructure in Higher Education using IT Balanced Scorecard
Clara Hetty Primasari (Universitas Atma Jaya Yogyakarta, Indonesia), Djoko Budiyanto Setyohadi (Universitas Atma Jaya Yogyakarta, Indonesia) 619
A Conceptual Framework of Cloud-Based Mobile-Retail Application for Textile Cyberpreneurs
Nik Zulkarnaen Khidzir (Global Entrepreneurship Research and Innovation Centre, Universiti Malaysia Kelantan & Faculty of Creative Technology and Heritage, Universiti Malaysia Kelantan, Malaysia), Wan Safra Diyana Wan Abdul Ghani (Universiti Malaysia Kelantan, Malaysia), Khairul Azhar Daud (Universiti Malaysia Kelantan, Malaysia) 625
Implementation of Winnowing Algorithm for Document Plagiarism Detection
Nurissaidah Ulinnuha (Universitas Islam Negeri Sunan Ampel, Indonesia), Muhammad Thohir (Universitas Islam Negeri Sunan Ampel, Indonesia), Dian Candra Rini Novitasari (Universitas Islam Negeri Sunan Ampel, Indonesia), Ahmad Hanif Asyhar (Universitas Islam Negeri Sunan Ampel, Indonesia), Ahmad Zaenal Arifin (Universitas PGRI Ronggolawe, Indonesia) 631
A Design of Coreless Permanent Magnet Axial Flux Generator for Low Speed Wind Turbine
Abdul Aziz Yusuf (University of Muhammadiyah Malang, Indonesia), M. Irfan (University of Muhammadiyah Malang, Indonesia), M. Razzaq (University of Muhammadiyah Malang, Indonesia) 637
Design of Hybrid System Power Management Based Operational Control System to Meet Load Demand
Zulfatman Has (University of Muhammadiyah Malang, Indonesia), Nurhadi Nurhadi (University of Muhammadiyah Malang, Indonesia), Fachmy Faizal (University of Muhammadiyah Malang, Indonesia) 642

Circuit Simulation for Wind Power Maximum Power Point Tracking with Four Switch Buck Boost Converter
Machmud Effendy, ME (University of Muhammadiyah Malang, Indonesia), Khusnul Hidayat (University of Muhamadiyah Malang, Indonesia), Nuralif Mardiyah (University of Muhammadiyah Malang, Indonesia) 648
Bioelectrical measurement for sugar recovery of sugarcane prediction using artificial neural network
Sucipto Sucipto (Agroindustrial Technology Departement, Faculty of Agricultural Technology, Universitas Brawijaya, Indonesia), Muhammad Arwani (Agricultural Technology, Universitas Brawijaya, Indonesia), Yusuf Hendrawan (Agricultural Technology, Universitas Brawijaya, Indonesia), Shinta Widaningtyas (Agricultural Technology, Universitas Brawijaya, Indonesia), Dimas F Al Riza (Universitas Brawijaya, Indonesia), Siming Yuliatun (Indonesian Sugar Research Institute, Indonesia), Supriyanto Supriyanto (Institut Pertanian Bogor, Indonesia), Agus Somantri (Indonesian Center Agricultural Post Harvest Research and Development, Indonesia) 652
Implementation of MEMS Accelerometer for Velocity-based Seismic Sensor
Amalia Cemara Nur'aidha (Brawijaya University, Indonesia), Didik R. Santoso (Brawijaya University, Indonesia), Sukir Maryanto (University of Brawijaya Malang, Indonesia) 657
Automatic User-Video Metrics Creations From Emotion Detection
Darari Nur Amali (Politeknik Elektronika Negeri Surabaya, Indonesia), Adnan Rachmat Anom Besari (Politeknik Elektronika Negeri Surabaya (PENS) & Electronic Engineering Polytechnic Institute of Surabaya (EEPIS), Indonesia), Ali Ridho Barakbah (Politeknik Elektronika Negeri Surabaya, Indonesia), Dias Agata (Poiliteknik Elektronika Negeri Surabaya, Indonesia) 663
Real Time SIBI Sign Language Recognition Based on K-Nearest Neighbor
Fitrah Humaira (Politeknik Negeri Madura, Indonesia), Supria Supria (Politeknik Negeri Bengkalis, Indonesia), Darlis Herumurti (Institut Teknologi Sepuluh Nopember, Indonesia), Kukuh Widarsono (Politeknik Negeri Madura, Indonesia) 669
Artificial Neural Network Parameter Tuning Framework For Heart Disease Classification
Mohamad Haider Abu Yazid (Universiti Teknologi Malaysia (UTM), Malaysia), Haikal Satria (Universiti Teknologi Malaysia, Malaysia), Shukor Talib (Unversiti Teknologi Malaysia, Malaysia), Novi Azman (Universitas Nasional & Universiti Teknikal Malaysia Melaka, Indonesia) 674
Winter Exponential Smoothing: Sales Forecasting on Purnama Jati Souvenirs Center
Fahrobby Adnan (University of Jember, Indonesia), Putri Damayanti (University of Jember, Indonesia), Gama Fajarianto (University of Jember, Indonesia), Antonius Prihandoko (University of Jember, Indonesia) 680
Analysis and Design of Decision Support System Dashboard for Predicting Student Graduation Time
Satrio Wibowo (Telkom University, Indonesia), Rachmadita Andreswari (Telkom University, Indonesia), Muhammad Hasibuan (Telkom University, Indonesia) 684
Sentiment Analysis Using Support Vector Machine Algorithm
Fransiska Pinem (Telkom University, Indonesia), Rachmadita Andreswari (Telkom University, Indonesia), Muhammad Hasibuan (Telkom University, Indonesia) 690
Group Formation Using Multi Objectives Ant Colony System for Collaborative Learning
Fitra Zul Fahmi (Telkom University, Indonesia), Dade Nurjanah (Telkom University, Indonesia) 696
Smart Traffic Light based on IoT and mBaaS using High Priority Vehicles Method
Muhammad Izzuddin Mahali (Yogyakarta State University, Indonesia), Bekti Wulandari (Yogyakarta State University, Indonesia), Eko Marpanaji (Yogyakarta State University, Indonesia), Umi Rochayati (Yogyakarta State University, Indonesia), Satriyo Dewanto (Yogyakarta State University, Indonesia), Nur Hasanah (Yogyakarta State University, Indonesia) 703
Correlation Between Bruto Domestic Products (Gdp) With Duty Schools
Hardianto Wibowo (Universitas Muhammadiyah Malang, Indonesia), Daroe Iswatiningsih (Universitas Muhammadiyah Malang, Indonesia), Wildan Suharso (Universitas Muhammadiyah Malang, Indonesia), Fachrunnisa Firdausi (Universitas Muhammadiyah Malang, Indonesia) 708
Mobile Learning: Utilization of Media to Increase Student Learning Outcomes
Edy Budiman (Universitas Mulawarman, Indonesia), Sitti Nur Alam (STIMIK Sepuluh Nopember, Indonesia), Mohammad Aldrin Akbar (University of Yapis Papua, Indonesia) 712
Study of the Android and ANN-based Upper-arm Mouse
Hartawan Sugihono (Ma Chung University, Indonesia), Romy Budhi Widodo (Universitas Ma Chung, Indonesia), Oesman Kelana (Universitas Ma Chung, Indonesia) 718
FVEC feature and Machine Learning Approach for Indonesian Opinion Mining on YouTube Comments
Aina Musdholifah (Universitas Gadjah Mada, Indonesia), Ekki Rinaldi (Universitas Gadjah Mada, Indonesia) 724
Clustering human perception of environment impact using Rough Set Theory
Ani Apriani (Sekolah Tinggi Teknologi Nasional Yogyakarta, Indonesia), Iwan Riyadi Yanto (Universitas Ahmad Dahlan, Indonesia), Septiana Fathurrohmah (Sekolah Tinggi Teknologi Nasional Yogyakarta, Indonesia), Sri Haryatmi (Universitas Gajah Mada, Indonesia), D Danardono (Universitas Gajah Mada, Indonesia) 730
E-Government Service Evaluation of Batu City Health Dept.using e-Govqual Approach and IPA Analysis
Evi Wahyuni, EDW (University of Muhammadiyah Malang, Indonesia), Dharma Pradana (University of Muhammadiyah Malang, Indonesia), Yasina Karina (University of Muhammadiyah Malang, Indonesia) 734
Implementation of Obfuscation Technique on PHP Source Code
Maskur Maskur (Universitas Muhammadiyah Malang, Indonesia), Zamah Sari (Universitas Muhammadiyah Malang, Indonesia), Ahmad Miftakh (Universitas Muhammadiyah Malang, Indonesia) 738
A Relative Rotation between Two Overlapping UAV's Images
Martinus Edwin Tjahjadi (National Institute of Technology (ITN) Malang, Indonesia), Fransisca Agustina (National Institute of Technology (ITN) Malang, Indonesia) 743
Automatic Estimation of Human Weight From Body Silhouette Using Multiple Linear Regression
Hurriyatul Fitriyah (Universitas Brawijaya, Indonesia), Gembong Edhi Setyawan (Universitas Brawijaya, Indonesia) 749
Variance and Symmetrical-based Approach for Optimal Alignment of 3D Model
Luh Putu Ayu Prapitasari (STMIK STIKOM Bali, Indonesia), Parth Rawal (Hamburg University of Technology, Germany), Rolf-Rainer Grigat (Hamburg University of Technology, Germany) 753

The Recognition Of Semaphore Letter Code Using Haar Wavelet And Euclidean Function
Leonardus Sandy Ade Putra (University of Diponegoro, Indonesia), Linggo Sumarno (Sanata Dharma University, Indonesia), Vincentius Abdi Gunawan (University of Palangka Raya, Indonesia) 759
Game Show Themed Adventure, Audience Involvement, Destination Image, and Audience Behavior
Irwansyah Irwansyah (Universitas Indonesia, Indonesia), Dwininta Widyastuti (Universitas Indonesia, Indonesia) 764
Visual Emotion Recognition Using ResNet
Azmi Najid (Faculty of Computer Science, Universitas Indonesia, Indonesia), Dina Chahyati (Universitas Indonesia, Indonesia) 770
A Feature-Based Fragile Watermarking of Color Image for Secure E-Government Restoration
Lusia Rakhmawati (Universitas Negeri Surabaya, Indonesia), Wirawan Wirawan (Institut Teknologi Sepuluh Nopember, Indonesia), Suwadi Suwadi (ITS, Indonesia), Titiek Suryani (Institut Teknologi Sepuluh Nopember, Indonesia), E Endroyono (ITS & Institut Teknologi Sepuluh Nopember, Indonesia) 776

Documents

Putra, L.S.A.[a] , Sumarno, L.[b] , Gunawan, V.A.[c]

The recognition of semaphore letter code using haar wavelet and euclidean function
(2018) *International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)*, 2018-October, pp. 759-763.

DOI: 10.1109/EECSI.2018.8752707

[a] Electrical Engineering of Diponegoro University, Semarang, Indonesia
[b] Department of Electrical Engineering, University of Sanata Dharma, Yogyakarta, Indonesia
[c] Department of Informatics Engineering, University of Palangka Raya, Palangka Raya, Indonesia

Abstract
Semaphore are one way of communicating over long distances using the semaphore flags. In Indonesia semaphore is used in scout activities as a method to send information in the form of a sentence containing the message. Sending the semaphore letter code tends to be difficult. Based on the need to semaphore learning, this research proposes an algorithm with image processing as a way to correct the movement of the semaphore letter code based on the image obtained by using the webcam. Digital image processing, Wavelet feature extraction, and Euclidean distance function are applied in this study to determine the best recognition rate of variation decimation and distance variation to sending semaphore letter code using the webcam. This study resulted in the best recognition rate of 95.4% in the 1st decimation, recognition rate reached 94.6% in decimation 2, and recognition rate reached 94.2% in decimation 3. The result of the introduction of the semaphore letter code is on the introduction of movement as far as 3 to 5 meters. © 2018 IEEE.

Author Keywords
Decimation; Euclidean function; Haar wavelet; Image processing; Semaphore flag

Editors: Stiawan D., Subroto I.M.I., Riyadi M.A., Aditya C.S.K., Has Z., Yudhana A., Minarno A.E.
Sponsors: Ministry of Research and Higher Education
Publisher: Institute of Advanced Engineering and Science

Conference name: 5th International Conference on Electrical Engineering Computer Science and Informatics, EECSI 2018
Conference date: 16 October 2018 through 18 October 2018
Conference code: 149304

ISSN: 2407439X
ISBN: 9781538684023
Language of Original Document: English
Abbreviated Source Title: Int. Conf. Electr. Eng. Comput. Sci. Informatics
2-s2.0-85069170734
Document Type: Conference Paper
Publication Stage: Final
Source: Scopus

The Recognition Of Semaphore Letter Code Using Haar Wavelet And Euclidean Function

Leonardus Sandy Ade Putra
Master Programs
Electrical Engineering of Diponegoro University
Semarang, Indonesia
leonardusandy@gmail.com

Linggo Sumarno
Department of Electrical Engineering
University of Sanata Dharma
Yogyakarta, Indonesia
lingsum@usd.ac.id

Vincentius Abdi Gunawan
Department of Informatics Engineering
University of Palangka Raya
Palangka Raya, Indonesia
abdi.g05@gmail.com

Abstract*— Semaphore are one way of communicating over long distances using the semaphore flags. In Indonesia semaphore is used in scout activities as a method to send information in the form of a sentence containing the message. Sending the semaphore letter code tends to be difficult. Based on the need to semaphore learning, this research proposes an algorithm with image processing as a way to correct the movement of the semaphore letter code based on the image obtained by using the webcam. Digital image processing, Wavelet feature extraction, and Euclidean distance function are applied in this study to determine the best recognition rate of variation decimation and distance variation to sending semaphore letter code using the webcam. This study resulted in the best recognition rate of 95.4% in the 1st decimation, recognition rate reached 94.6% in decimation 2, and recognition rate reached 94.2% in decimation 3. The result of the introduction of the semaphore letter code is on the introduction of movement as far as 3 to 5 meters.

Keywords*— Semaphore Flag, Image Processing, Haar Wavelet, Euclidean Function, and Decimation.

I. INTRODUCTION

Semaphore is one of many ways to communicate over long distances using semaphore flags measuring 45 cm x 45 cm tied to a 60 cm stick [1]. In Indonesia has been applied as one of the skills that every individual must have in scout activities. To communicate with the semaphore, the flag is held in each hand then adjusted in a certain position as in Figure 1, to represent the letter that will be transmitted as a sentence of information. The semaphore flags used in Indonesia are generally red and yellow [2]. Sending information by using semaphore flags is commonly used in the maritime world as the delivery of information between ships, and also used in the scout world as sending the semaphore letter code [1] [3].

In practice to learn the semaphore movement a semaphore sender requires someone who can see whether the position of the sender is proper or not in delivering semaphore codes. This is very necessary because in each semaphore code delivery has a different position for each letter. Thus, this makes less effective learning of semaphore code if done by a single self.

Semaphore movement has been developed in the form of computer programs to be able to support learning the semaphore letter code in the scout world [5].

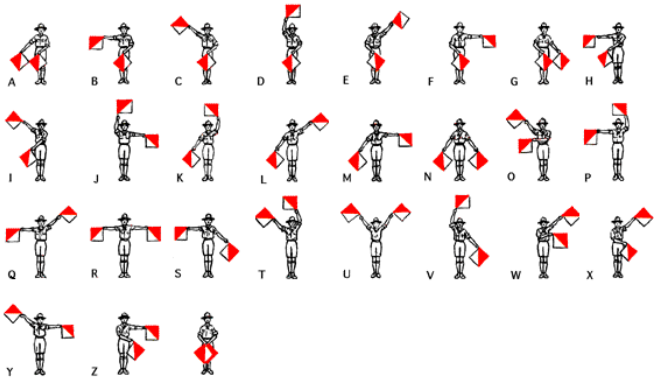


Fig 1. Movement of Semaphore Letter Code [4].

In a previous research [1], the introduction of letters using the Kinect tool with a maximum distance of 2.5 meters and yields a reading rate of 88% and has a weakness that is the length of time used to complete the introduction of letters. Research conducted by [6], semaphore readings obtained a recognition rate of 90% and had constrains in terms of angular readings due to different physical shapes of the sender. Research [5] has succeeded in making computer applications that can help the introduction of the semaphore letters, a weakness in this system is the absence of an instructor role to guide users on using semaphores.

The application of elements of practical and appropriate technology is needed as a supporter as well as an effective solution in solving the problems above, and one of them is by using image processing. Image processing is a generic term for various techniques whose existence is to manipulate and modify images in different ways [7]. The processing of two-dimensional images via a digital computer [8]. Image processing, among others, plays a role in separating the object from the background [9]. The system which will be created can mimic the ability of the human eye to recognize objects in the form of a movement of code delivery that will help humans in learning the delivery as well as receive the semaphore letter code. It can help the user know whether the movement is done right or less precise.

Tests in this study will use variations of distance: 3 meters, 3.5 meters, 4 meters, 4.5 meters and 5 meters and variations of decimation: (1) 32 x 32, (2) 16 x 16, and (3) 8 x 8. This research requires some supporting tools such as webcam [10] [11] which serves to capture motion picture of semaphore letter code, a laptop is then needed to serve as a

978-1-5386-8402-3/18/$31.00 ©2018 IEEE

place to process images to be recognizable so that the information can be delivered to users and software Matlab as a semaphore letter programming code [12] [13].

II. Research Methods

This study uses variation of distance and decimation to know the effect on the introduction of semaphore letter code. The stages of the introduction phase of the semaphore letter code can be seen in Figure 2. The first process is semaphore letter code capturing using a laptop as a digital data processor machine. The captured image will then enter the preprocessing process and the output of this process will enter the self-extraction process using the Haar Wavelet. The result of the feature extraction will be compared with the data on the database by using the Euclidean. The output of the distance function will display the semaphore letter code on the monitor screen.

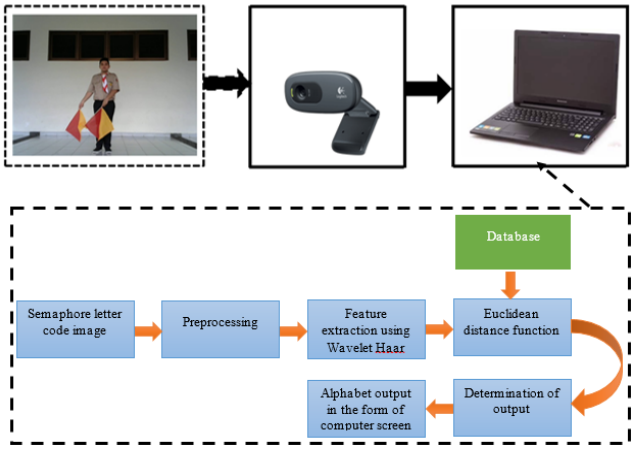


Fig 2. The Flow Diagram of The Semaphore Letter Recognition Process.

A. Data Collecting

The total of used images for semaphore letters codes is 650 images. The images is obtained from 5 visuals, each of which displays the semaphore letter code from A to Z with variations of distance 3 meters, 3.5 meters, 4 meters, 4.5 meters and 5 meters. Each casted distance produces 26 images, so the images obtained from 1 view is 130 images. As many as 390 image data is used as a database and as many as 260 image data as test data.

B. Preprocessing

Preprocessing an image is a process aimed to obtain objects contained within the image or to divide the image into several regions of each objects or region (that has) similarities [9]. The preprocessing step is started by converting the RGB image into a HSV image, continued by a process of colour segmentation on the image. The colour segmentation is done to achieve the yellow part of the image as it is on the semaphore flag. The next step is to "crop" and "resize" the image according to the image's size. The image processing step can be seen on Figure 3.

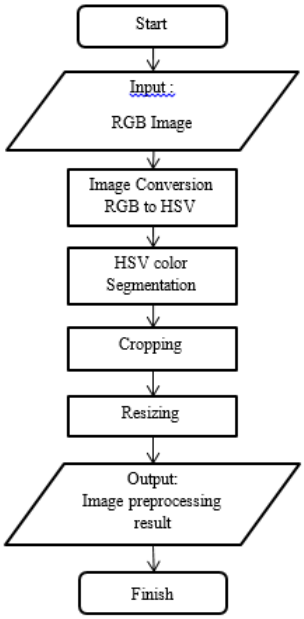


Fig 3. Flow Chart of Image Preprocessing.

Figure 4, shows the RGB image that has been obtained from the webcam will be converted to HSV image, then the image will be preprocessed to obtain the yellow color contained in the semaphore flag. To get the yellow color corresponding to the color on the semaphore flag, researchers used the color-range of the Hue scale of 35-50 on the color scale shown in Figure 5.

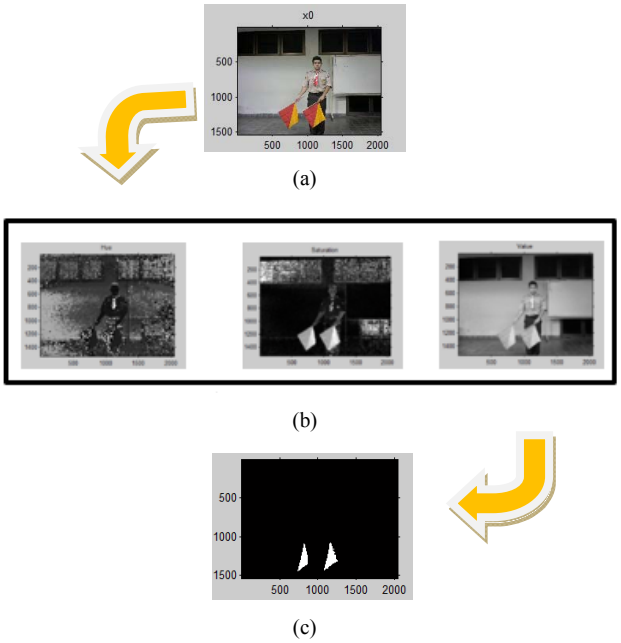


Fig 4. Image Segmentation Process to Yellow Color an Semaphore; (a) RGB Imagery; (b) Results of RGB to HSV Image Conversion; (c) The Image is a Yellow part of The Semaphore Flag.

Fig 5. Hue Scale [14].

C. Haar Wavelet

Wavelet is defined as a small wave or short wave. The Wavelet's transformation will convert a signal into a Wavelet sequence. The shortwave is a basic function that lies at different times [15], seen in Figure 6. *Haar Wavelet* is the simplest wavelet, introduced by Alfred Haar in 1909. The coefficient of transformation low pass filter (Eq. 1) and high pass filter (Eq. 2) are the base functions of Haar Wavelet. In the image, high pass filters and low pass filters can be represented as 2D matrices. The decomposition of flattening and substraction that has been done before is actually the same as doing the decomposition (transform) image with Haar Wavelet. Both filters are orthogonal but not orthonormal. The orthogonal and orthonormal tapis Haar are [16]:

$$h_0 = \left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right) \tag{1}$$

$$h_1 = \left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right) \tag{2}$$

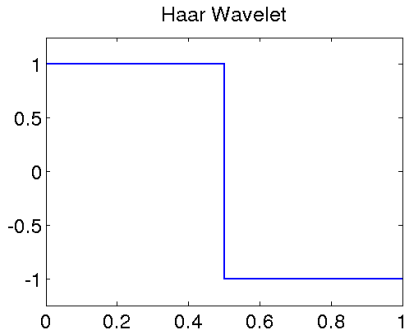


Fig 6. Haar Wavelet [17].

D. Euclidean Distance

Euclidean distance is the most commonly used metric to calculate the similarity of 2 vectors. The smaller the value of Euclidean distance to an object, the higher the level of similarity. The Euclidean distance calculates the roots of squares of differences of 2 vectors [9]. The formula of the Euclidean distance.

$$j(v_1, v_2) = \sqrt{\sum_{k=1}^{N} \left(v_1(k) - v_2(k)\right)^2} \tag{3}$$

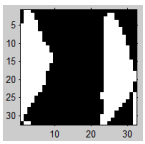
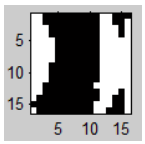
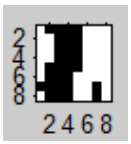
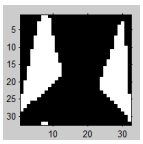
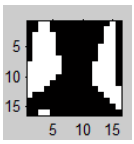
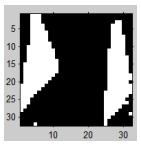
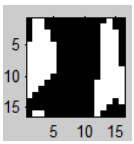
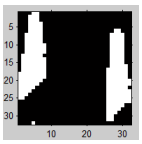
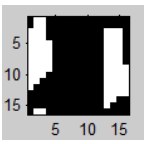
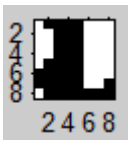
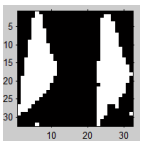
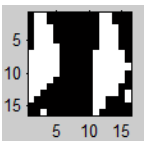
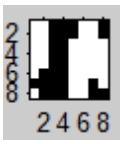
Where v1 and v2 are the two vectors whose distance will be calculated and N denotes the length of the vector. Distance function will find the difference of the minimum value between data from the self-extraction's output with the data on the database as an output from the recognition of the semaphore letter code.

III. Result and Discussion

A. Testing Using Haar Wavelet

Tests are conducted to determine the effect of distance variation and variation of the decimation on the success rate of introducing the semaphore letter code and to know the distance and the value of the decimation that has the optimal success rate. The A letter image on semaphore letter code with many variations of the distances and decimations can be seen on Table I.

TABLE I. The Image of The Variation of Distance to The Variation of the Decimation.

Distance (m)	Decimation		
	32 X 32	16 X 16	8 X 8
3			
3.5			
4			
4.5			
5			

It is seen that the greater the value of the decimation variation, the smaller the pixel level in the image, causing the image to break so that the recognition rate will be lower. The farther the distance is used, the lower the recognition rate. This is because the greater the value of the decimation variation, the decimation experiences repeated convolution and downsampling process as many as the users want, this process resulted in the inserted image to become more blur so that the level of recognition will be lower.

B. Level of Recognition

At the level of recognition, as many as 260 test data that have been in the process when testing the data will be compared with the data stored in the database. Each value from the Euclidian function on different decimations and

letters with the distance of 3.5 meters can be seen on Table II.

TABLE II. THE DISTANCE VALUE OF EACH LETTER IN THE VARIATION OF THE DECIMATION

Alphabet	Alphabet Image	Decimation		
		32 X 32	16 X 16	8 X 8
A		5.8813	3.1922	1.7176
B		13.0396	7.1204	4.01
C		14.0755	7.6714	4.3012
D		14.2471	7.6805	4.3417
E		14.308	7.9618	4.3566
F		14.5674	7.9912	4.4034
G		14.6888	8.0629	4.4553
H		14.8482	8.0889	4.4855
I		15.412	8.4178	4.7476
J		15.4522	8.5358	4.8693
K		15.5155	8.6081	4.8785
L		15.6003	8.6833	4.899
M		15.6407	8.7063	4.983
N		15.6761	8.7247	5.0259
O		15.7143	8.8532	5.0784
P		15.7575	8.9208	5.3852
Q		16.5466	9.5362	5.7367
R		16.9414	9.7883	5.7376
S		16.9906	9.7974	5.8421
T		17.057	9.8194	5.8652
U		17.0936	9.9489	5.9615
V		17.5923	9.979	5.9867
W		17.6227	10.007	6.0893
X		18.1135	10.2937	6.1237
Y		19.0481	10.458	6.1709
Z		20.05	11.0977	6.3561

From the tests that have been done, the value of variations of the decimation and distance variations that have the best recognition rate can be obtained. The result of the average variation of the decimation and the distance variation which has the best recognition rate can be shown in Figure 7, there are 3 different colors, the blue color represents the result of the influence of the 1st decimation to the distance variation. The red color represents the result of the effect of decimation 2 on the variation of distance and the green color representing the result of the effect of the decimation 3's to the distance variation. The process on the decimation shows that, on decimation 1, image will be processed once on the self-extraction Haar Wavelet process to an image with the size of 32 x 32. On decimation process 2, image will be feature extracted twice so that the image's size will changed into 16 x 16. On decimation process 3, datas will be self-extracted and processed three times and the process will be repeated three times so that the image's size will be 8 x 8.

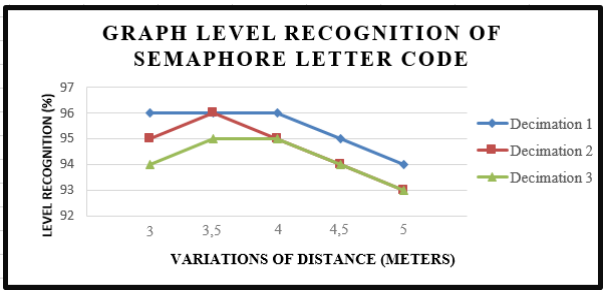


Fig 7. Graph Level Recognition of Semaphore Letter Code.

For example, the effect of decimation variation on the distance can be known in the 1st decimation to get the recognition rate of 96%, for the 2nd decimation gained 95% recognition rate and the 3rd decimation gained a recognition rate of 94%. The greater the value of decimation variation, the pattern recognition rate will be lower, because the greater the chosen decimation value will make the process of repetition of convolution and downsampling more and more in accordance with the variation of the decimation chosen by the user. This will cause the image to be blur and affect the lower recognition rate.

In this study, the percentage of semaphore letters recognition rates on the decimation variation of the overall distance is shown in Table III.

TABLE III. PERCENTAGE OF RECOGNITION RATE

Decimation	Percentage of recognition rate
1	95.4%
2	94.6%
3	94.2%

It is known that at the 1st decimation has the best recognition rate with the percentage of recognition rate of 95.4%.

IV. CONCLUSION

In this study, the percentage of the recognition rate of the semaphore letter code in the 1st decimation is 95.4%, the decimation 2 is 94.6%, and the decimation 3 is 94.2%. So the best recognition rate is in the 1st decimation with the

recognition rate at 3 meters distance of 96%, the distance of 3.5 meters by 96%, the distance of 4 meters by 96%, the distance of 4.5 meters by 95%, and the distance of 5 meters by 94 %. The results obtained show that the introduction of the semaphore letter code by using color recognition on the semaphore flag and using Wavelet feature extraction, can result in better recognition rates with longer distances.

REFERENCES

[1] A. Rachmad and M. Fuad, "Geometry algorithm on skeleton image based semaphore gesture recognition," *J. Theor. Appl. Inf. Technol.*, vol. 81, no. 1, pp. 102–107, 2015.

[2] A. Madore, "Make Semaphore Flags," 2015.

[3] Q. Zhao, Y. Li, N. Yang, Y. Yang, and M. Zhu, "A convolutional neural network approach for semaphore flag signaling recognition," in *2016 IEEE International Conference on Signal and Image Processing, ICSIP 2016*, 2017, pp. 466–470.

[4] Kualo, "Semaphore." [Online]. Available: https://www.omniglot.com/writing/semaphore.htm.

[5] H. Sinaga, "Learning Application on Signal Scout Semaphore Multimedia And Web-Based Using Computer Assisted Instruction Method," *J. Inf. dan Teknol. Ilm.*, vol. V, no. 3, pp. 160–164, 2015.

[6] N. Iwane, "Arm movement recognition for flag signaling with Kinect sensor," in *Proceedings of IEEE International Conference on Virtual Environments, Human-Computer Interfaces, and Measurement Systems,VECIMS*, 2012, pp. 86–90.

[7] R. Gonzalez and R. Woods, *Digital image processing*. 2002.

[8] A. K. Jain, *Fundamentals of Digital Image Processing*, vol. 14, no. 8. 1989.

[9] A. S. Abdul Kadir, "Teori dan Aplikasi Pengolahan Citra," no. May, p. 640, 2013.

[10] D. M. Togasaki *et al.*, "The Webcam system: A simple, automated, computer-based video system for quantitative measurement of movement in nonhuman primates," *J. Neurosci. Methods*, vol. 145, no. 1–2, pp. 159–166, 2005.

[11] T. L. W. Ce, "HD video desktop collaboration."

[12] The Mathworks Inc., "MATLAB - MathWorks," *www.mathworks.com/products/matlab*, 2016. .

[13] S. E. Lyshevski, "MATLAB Basics," *Eng. Sci. Comput. Using MATLAB®*, pp. 1–26, 2003.

[14] C. Wikimedia, "File_HueScale," 2018. [Online]. Available: https://commons.wikimedia.org/wiki/File:HueScale.svg.

[15] L. Sumarno, "Evaluasi Unjukkerja Ekstraksi Ciri Wavelet dalam Pengenalan Huruf Tulisan Tangan Berderau dan Terskala menggunakan Jaringan Syaraf Probabilistis," pp. 1–15.

[16] D. Putra, *Pengolahan Citra Digital*. Yogyakarta: C.V ANDI, 2010.

[17] Mathematik, "Wavelet and multiscale library - Download," 2017. [Online]. Available: https://www.mathematik.uni-marburg.de/~waveletsoft/demo.php.